SUSQUEHANNA RIVER BASIN STUDY

LAND TREATMENT AND MANAGEMENT

UNITED STATES DEPARTMENT OF AGRICULTURE

APRIL 1968

LAND TREATMENT AND MANAGEMENT STUDIES

SUSQUEHANNA RIVER BASIN

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE

Field Advisory Committee

Chairman - Ivan McKeever, Soil Conservation Service
Member - P. Thomas Cox, Economic Research Service
Member - Frank E. Casanova, Forest Service

April 1968

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ABSTRACT

A major shift from cropland to urban and other nonagricultural land is expected in the Susquehanna River Basin by 1985. It is anticipated that only about 50 percent of the 1964 cropland acreage will be used to produce crops in 1985. By 1985, it is estimated that an additional 222,400 acres of land will be needed for urban; 162,300 acres for highways; and 112,100 acres for water-based recreation areas. The expected sources of land to meet these needs are 281,400 acres from crop and pastureland and 215,400 acres from forest and other land.

The present land use in the Basin is 55 percent forest land, 24 percent cropland, 11 percent urban and other areas, and 10 percent pasture or grass.

Land treatment and improved management are currently needed on about 65 percent of the cropland and 60 percent of the pastureland. The total estimated initial cost of installing the needed land treatment practices on cropland amounts to $104,133,703. The total estimated initial cost of land treatment measures for pastureland amounts to $69,617,646. The rate of applying land treatment measures, to 1985, should be accelerated 20 percent. The costs for accelerated treatment would be $12,181,348 for cropland and $9,746,429 for pastureland.

Treatment applied on all cropland would reduce soil loss almost 11 million tons per year, and would reduce runoff from a 100-year storm of four-days duration by an average of 8.7 percent. Treatment applied on all pastureland would reduce soil loss over 838,000 tons per year, and would reduce runoff from a 100-year storm of four-days duration an average of 5.5 percent.

Infertile overwash, flood plain scour, and streambank erosion occur locally but are insignificant in the Basin. In most cases, treatment of these areas is economically unfeasible.

The 916 million acres of forest land in the Basin need at least one of the following practices for protection and improvement: fire control, reforestation, grazing control, insect and disease control, erosion control, hydrologic stand improvement, and protection from improper cutting practices.

If the forest lands in the Basin are to be improved, present programs will have to be accelerated. The cost of recommended accelerated forest programs, including technical assistance and installation, is $46,051,000.

Benefits derived from the forest land treatment program are surface runoff reduction and erosion reduction. Additional benefits that will be realized from the planned program will be the enhancement of natural beauty and wildlife habitat, creation of a more pleasant environment in which to live and play, and expansion of the economy through an increase in the production and quality of raw materials for the wood products industries.

Land treatment on nonagricultural land is needed to protect and improve 191,710 acres, not including mined areas. A reclamation plan should be developed for all problem mining areas which include 123,700 acres of strip-mine coal spoil areas, 22,500 acres of deep-mine culm piles and culm material, and about 25,000 acres of areas surface-mined for stone, clay, sand, gravel, and other minerals. The cost for reclamation of these problem areas is estimated to range from $45 to $100 per acre.

INTRODUCTION

Objectives

The Susquehanna River Basin Study was authorized by Congress in October 1961. The purpose of the United States Department of Agriculture's activities in the study is to contribute to the preparation of a comprehensive plan for the coordinated and orderly development of the water and land resources of the Susquehanna River Basin. This plan will be for the use of local, State, and Federal agencies in their specific planning and construction to assure that the conservation, development, and utilization of water, land, and related resources are directed to meet immediate and projected needs.

The United States Department of Agriculture was given the responsibility of appraising the present and future use of water and related land resources. The Department, in turn, assigned the responsibility for making the needed studies to the Economic Research Service, Forest Service, and the Soil Conservation Service. Four studies were made; namely, (1) Inventory of Potential Upstream Reservoir Sites, (2) Floodwater Damage in Upstream Watersheds, (3) Agricultural Water Requirements, and (4) Land Treatment and Management.

This report appraises the land treatment and management and their relationship to water resources development. It reflects:

1. An inventory of the land resources as compiled from the basic soil survey and other data to provide a base for determining soil, erosion, land use, and cover conditions.

2. An estimate of land use adjustments and treatments needed on open and forest land for proper utilization of land resources within the capability of the land. It also includes consideration of potential recreation land needs and treatments.

3. An estimate of benefits that can be expected from installation of land treatment measures.

Agency Contributions

The Economic Research Service provided:

1. Information on the past and present agricultural production and marketing and the agricultural economy of the Basin.

2. An estimate of the agricultural product and land needs for both present and future.

3. Nonagricultural land requirements for urban, highway, and water-oriented recreation use for present and future conditions.

The Forest Service provided:

1. An analysis of forest land use, ownership, condition, and the relationship of condition to the water resource.

2. Treatment needs to improve the hydrologic condition of forested areas, a suggested program, and estimated cost.

The Soil Conservation Service provided:

1. The inventory of soils, erosion, land use, and cover conditions for open land.

2. The estimate of land use adjustment and treatment needs for the open land. Consideration was given to potential recreation land needs and treatments.

Size and Location

The Susquehanna River Basin includes an area of approximately 17½ million acres or 27,500 square miles. Seventy-six percent of this land is in Pennsylvania, 23 percent is in New York, and one percent is in Maryland. All or parts of 66 counties are included in this area (Figure 1, page 5).

Cover Conditions and Land Use

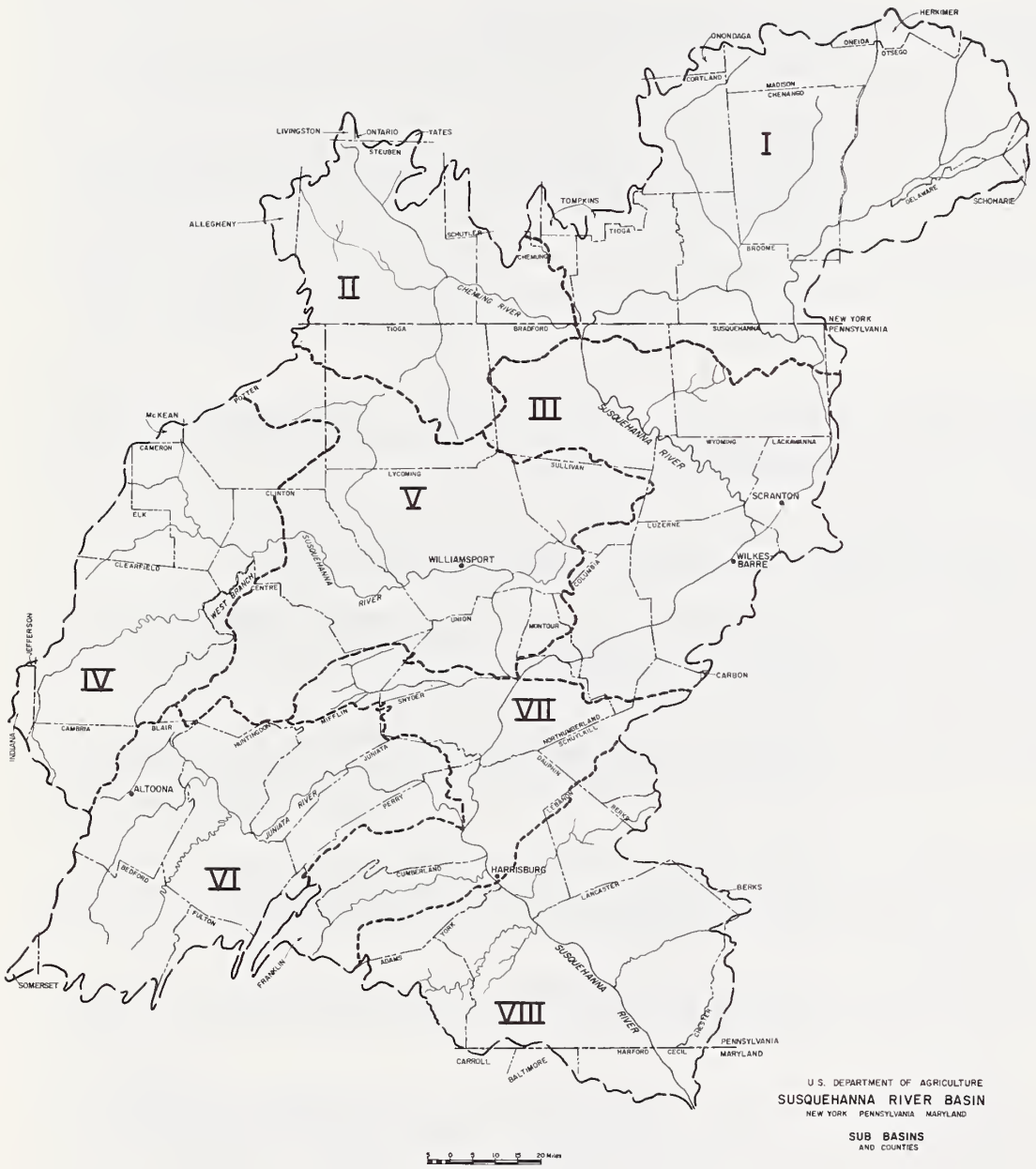
The land use in the Basin is 55 percent forest land, 24 percent cropland, 11 percent urban and other areas, and 10 percent pasture or grass. At least one-half of the cropland is in hay. Therefore, at any given time, more than 77 percent of the Basin has a cover of grass and trees. A trend towards reforestation and less intensive crop rotations will increase the amount of grass and forest cover.

The hydrologic cover conditions in cropland, hayland, and pastureland were rated as "good", "fair", and "poor" as defined in the Soil Conservation Service's National Engineering Handbook, Section 4, Part 1, Chapter 8. The hydrologic conditions in the forest land were rated as "excellent", "very good", "good", "fair", "poor" or "very poor" as defined in the U. S. Forest Service's Forest and Range Hydrology Handbook, Chapter 4.

Land Capability

Soils are grouped into capability classes which are a means of measuring soil limitations and degree of hazard when used for agriculture. Capability classes are numbered from I to VIII with the degree of use limitation increasing as the number increases. Capability classes I through IV are suitable for cultivation. They can also be used for woodland, wildlife, or recreation. Soils in Class I have few limitations, while soils in Class IV have severe limitations. Soils in Class

FIGURE 1



U.S. DEPARTMENT OF AGRICULTURE

SUSQUEHANNA RIVER BASIN

NEW YORK PENNSYLVANIA MARYLAND

SUB BASINS
AND COUNTIES

V through VIII are generally unsuited for cultivation and have increasing limitations for pasture, woodland, and wildlife use as the class number increases.

Land Suited for Cultivation and Other Uses

Class I . . . . Soils which have few limitations that restrict their use.

Class II . . . Soils which have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III . . . Soils which have severe limitations that may reduce the choice of plants or require special conservation practices, or both.

Class IV . . . Soils which have very severe limitations, that restrict the choice of plants, require very careful management, or both.

Land Limited in Use - Generally Not Suited for Cultivation

Class V . . . . Soils which have severe limitations that are impractical to remove. Use is limited largely to pasture, woodland, or wildlife.

Class VI . . . Soils which have severe limitations. Generally unsuited for cultivation. Use is largely limited to pasture, woodland, wildlife, or some recreation.

Class VII . . . Soils which have very severe limitations, unsuited for cultivation. Use is largely limited to pasture, woodland, wildlife, or some recreation.

Class VIII. . . Soils which have very severe limitations. Use is limited to watershed protection, wildlife, or some recreation.

Land capability was used as a basis or guide in developing the land treatment needs for crop and pastureland. The acreage in each land use by land capability class is shown in Appendix I, page 1, Table 5.

The Pennsylvania Soil and Water Conservation Commission and the Pennsylvania farm organizations have requested that land in Capability Classes I, II, and III be preserved for agricultural use and that residential, industrial, and housing developments be kept to a minimum on this land. The accomplishment of this objective will undoubtedly require the passage of land use regulations or zoning ordinances in order to keep this land in agricultural use.

Land Requirements

The Economic Research Service used an activity analysis with linear programming techniques in estimating the best use of the land resources in the Susquehanna River Basin for the year 1985. Production patterns and resource requirements, as specified by the linear programming analysis, represent the use of the resources in such a way as to minimize the total production costs. In reality such an ideal use of resources is unlikely by 1985, especially to the degree indicated by the analysis. The analysis, however, does indicate the direction of utilization. The "ideal" estimates were adjusted to reflect a more realistic land use by 1985.

Land Use

Land classification and use determination are the first steps in delineating the soil and water problems which require selected land treatment measures. The major uses of land were estimated for 1964 using, as a basis, the Conservation Needs Inventory of 1958 (Appendix I, page 1, Table 5). Land use and land treatment estimates are important factors in developing water resources to meet future needs.

The major shift in land use has been from cropland to urban and other nonagricultural uses; such as, highways, public buildings, and recreation. Urban and other land use will likely more than double by 1985. The increase in urban and other uses was at the expense of cropland. About 50 percent of the 1964 cropland will be used to produce crops in 1985. The table below shows the estimate of land use acreage for the Susquehanna River Basin.

TABLE 1

Land Use Acreage Estimates for the Susquehanna River Basin, 1964 - 1985

Use	1964 (Acres) 1/	1985 (Acres)
Cropland	4,157,000	2,167,000
Pastureland	1,657,000	1,171,000
Forest Land	9,673,000	9,983,000
Urban Land	737,000	960,000
Other Land 2/	1,182,000	3,126,000
Total Land Area	17,407,000	17,407,000

1/ Figures rounded do not agree exactly with those in text and Appendix tables.

2/ Other Land includes nonagricultural land, outside urban areas of more than 2500, and agricultural land not used as cropland, pasture, or forest land.

Land use by subbasins for 1964 and 1985 is shown in Appendix I, page 2, Tables 6 and 7.

Land Treatment

Land treatment and improved management are currently needed on about 65 percent of the cropland and 60 percent of the pastureland. Land treatment and management needs on cropland are related primarily to the protection and improvement of the land from erosion, excess water, and unfavorable soil conditions (Appendix I, page 3, Table 8). The treatment and management needs on pastureland are related primarily to establishment and maintenance of cover (Appendix I, page 4, Table 9). The treatment and management needs for crop and pastureland were developed by the Soil Conservation Service and are based on the acreages in these uses in 1964. The needs were calculated on this basis because landowners will undoubtedly treat thousands of acres of crop and pastureland before it is converted to other uses. Treatment will protect this land until it is converted to other uses and, in many cases, after it has been converted. The Pennsylvania, Maryland, and New York Soil and Water Conservation Needs Inventories were used as a basis for making the estimates.

Cropland Treatment Needs

There are 4,157,120 acres in the Basin being used for cropland. Only 238,615 acres do not have actual or potential problems that limit use except those related to restoration and maintenance of fertility and tilth which may be corrected by high level management.

Soil erosion is a dominant problem on 3,197,645 acres of cropland. Included is land with a dominant erosion problem, land with a dominant erosion problem and a secondary problem of excess water, and land with a dominant problem of erosion and a secondary problem of unfavorable soil conditions. Treatment has been applied on 920,415 acres of this land. The remaining 2,277,230 acres can be protected and improved through the use of proper conservation practices and high level management.

Excess water caused by a high water table or by temporary flooding is a dominant problem on 544,505 acres of cropland in the Basin. Included is land with only a dominant excess water problem, land with a dominant excess water problem and a secondary problem of unfavorable soil conditions. Treatment has been applied on 210,380 acres of this land. The remaining 334,125 acres can be protected and improved by providing drainage or protection from flooding and through the use of erosion control practices and high level management.

Unfavorable soil conditions such as stoniness, shallowness to bedrock, low moisture holding capacity, low fertility, or other similar conditions are a dominant problem on 176,355 acres of cropland. Included is land with only a dominant unfavorable soil condition, land having a dominant unfavorable soil condition and a secondary problem of erosion, and land having a dominant unfavorable soil condition and a secondary problem of excess water.

Treatment has been applied on 86,820 acres of this land. The remaining 89,535 acres can be protected and improved through the use of erosion control, drainage practices, and high level management.

Pastureland Treatment Needs

There are 1,657,380 acres now being used for pasture. Treatment is not needed or is not feasible on 667,020 acres. Estimates indicate that it was not feasible to treat about 12.7 percent of this area. Treatment and management are needed to protect and improve the remaining 990,360 acres.

There are 902,490 acres that need to be established or reestablished or the vegetative cover improved. This area includes the acreage expected to be converted from other uses, land in pasture in such poor condition that it needs to be completely reestablished, and land in pasture on which vegetative cover was inadequate but could be restored to a satisfactory condition by improvement and management measures.

There are 187,510 acres that need protection from overgrazing, erosion, or encroachment of woody and noxious plants. The overgrazing problem can be corrected by proper management of livestock, or the installation of supplementary watering facilities. Erosion can be controlled through the use of erosion control measures. Excess water is a problem on 189,980 acres. The excess water problem can be improved through the use of drainage or flood protection measures. More than one of these problems may occur on the same acreage.

Estimated Land Treatment Costs

The estimated land treatment costs for cropland and pasture were developed by the Soil Conservation Service using 1964 rates.

The land treatment costs for cropland are based on the installation or establishment of contour cultivation, stripcropping systems, diversions, terraces, grassed waterways and outlets, open drains, tile drains, or other permanent type soil and water conservation practices. They do not include fertilizer, lime, and other production costs. The initial installation of these practices will cost landowners about $87,068,933 as shown in Appendix I, page 6, Table 11. Technical assistance needed to install these practices will cost an additional $17,065,770. The total estimated initial cost of installing the needed land treatment practices on cropland amounts to $104,134,703. Appendix I, page 5, Table 10, outlines an estimated timetable for installing these needed practices.

The estimated needed land treatment costs for pastureland are based on establishing new pasture, reestablishing old pasture, improvement of cover on land now in pasture, and protecting pastureland from overgrazing, erosion, encroachment of woody and noxious plants, and excess water. These costs include fertilizer, lime, seed, labor, machinery,

spray materials, and the installation of needed diversions, open drains, tile drains, additional stock watering facilities, fencing, and the reseeding of steep land in contour or field strips. The initial establishment or installation of these land treatment measures will cost landowners about $65,744,684 as shown in Appendix I, page 9, Table 14. Technical assistance needed in the establishment or installation of these land treatment measures will cost an additional $3,872,962. The total estimated initial cost of the land treatment measures for pastureland amounts to $69,617,646. Appendix I, page 8, Table 13, outlines an estimated timetable for installing or applying the practices and treatments.

Estimated Benefits from Land Treatment

Land treatment to be applied on cropland by 1985 will reduce the average annual soil loss more than six million tons per year. Treatment applied on all cropland would reduce soil loss almost 11 million tons per year, or an average of about 68 percent (Appendix I, page 11, Table 16).

Land treatment to be applied to cropland by 1985 will reduce the runoff from a 100-year storm of four days duration over 48,000 acre-feet. Treatment applied on all cropland would reduce the runoff almost 88,000 acre-feet, or an average of 8.7 percent (Appendix I, page 12, Table 17).

Land treatment to be applied to pastureland by 1985 will reduce the average annual soil loss more than 586,000 tons per year. Treatment applied on all pastureland would reduce soil loss over 838,000 tons per year, or an average of 71 percent (Appendix I, page 13, Table 18).

Land treatment to be applied to pastureland by 1985 will reduce the runoff from a 100-year storm of four days duration over 11,000 acre-feet. Treatment applied on all pastureland would reduce the runoff over 16,000 acre-feet, or an average of 5.5 percent (Appendix I, page 14, Table 19).

Need for Acceleration of Land Treatment

The crop and pastureland treatment estimated to be accomplished by 1985 is based on the amount of technical assistance and cost-sharing available to landowners in 1964. The rate of applying land treatment measures should be accelerated 20 percent. Additional funds for technical assistance and cost-sharing will need to be made available to achieve this acceleration over and above the 1964 levels.

If the land treatment on cropland was accelerated 20 percent to 1985, it would result in the treatment of an additional 303,125 acres (Appendix I, page 5, Table 10). The cost of this acceleration would amount to $10,188,182 for installation and $1,993,166 for technical assistance (Appendix I, page 7, Table 12). This accelerated land treatment would reduce the erosion loss an additional 1,206,975 tons per year (Appendix

I, page 11, Table 16). Runoff from a 100-year frequency storm would be reduced an additional 9,657 acre-feet (Appendix I, page 12, Table 17).

If the land treatment on pastureland was accelerated 20 percent to 1985, it would result in the treatment of an additional 138,650 acres (Appendix I, page 8, Table 13). The additional cost of this acceleration would amount to $9,202,123 for installation and $544,306 for technical assistance (Appendix I, page 10, Table 15). The accelerated land treatment would reduce the erosion loss an additional 117,333 tons per year (Appendix I, page 13, Table 18). Runoff from a 100-year frequency storm would be reduced an additional 2,276 acre-feet (Appendix I, page 14, Table 19).

The change in land ownership that will take place to 1985 will undoubtedly have an influence on the total amount of land treatment measures on the land.

The recommended acceleration in the land treatment program will encourage landowners to make needed land use adjustments. It will also speedup the installation or application of needed soil and water conservation measures and treatment. These land use adjustments, along with the installation and application of needed measures and treatment, will improve the potential of the Basin to produce agricultural crops over a long period of time without causing soil deterioration. The recommended acceleration will provide monetary benefits to the landowner, thereby improving the economy of the Basin.

The land treatment program recommended for the Basin will conserve and improve the natural resources, establish a permanent and balanced agriculture, improve the economy, and reduce the hazards of flooding and sedimentation.

Other Agricultural Land Damage

Infertile overwash is sand and gravel deposited on flood plains by floodwaters. Minor amounts of infertile overwash occur locally but are considered insignificant in the Basin. In most cases, concentrations of overwash on the flood plains are caused by tributaries in narrow valleys having steep gradient which results in high stream velocities. The high velocities enable the streams to carry large particles to the flood plains where a sudden drop in velocity causes the streams to deposit their sediment load. The result is a concentration of overwash of relatively large sized particles in a small area.

Infertile overwash can be eliminated in most cases by constructing debris basins to intercept the material before it reaches the flood plain. This is generally considered economically unfeasible since the problem is usually very localized and the cost is high.

Flood plain scour is caused by a stream overflowing its banks during flood stage. Most damage occurs where a stream cuts across a meander

and scours off the topsoil, leaving the subsoil exposed. Flood plain scour is a minor problem. Most of the scour damage observed was in the upstream parts of the Basin on low value land.

Flood plain scour can be eliminated by use of flood control measures which include both structures and land treatment; however, structural measures are usually not economically feasible because of the low value of the land involved.

Streambank erosion in itself causes minor damage to the land within the Susquehanna River Basin. The majority of land being damaged is of low value; therefore, the monetary loss is relatively small. However, the sediment produced by this type of erosion reduces water quality, damages fish habitat, and contributes to the sedimentation problem in the streams and rivers.

Prevention of streambank erosion is usually costly. Establishment and maintenance of permanent vegetation is probably the best and least expensive method of protecting streambanks against erosion. Flood control measures, such as stream channel improvement, are effective in reducing streambank erosion.

Farm Recreational Opportunities

The farmlands in the Basin provide many opportunities for farm families to develop private income producing recreation enterprises. The amount of land required is usually small. Many of these activities and facilities can be incorporated into a multiple use program for the farmland.

Tent and trailer camping areas, hunting cabins, vacation cabins, picnic areas, walking or riding trails, and other similar facilities can be developed in connection with open land and farm woodlots. Vacation farms and riding stables can also be developed in conjunction with the farm operation.

Outdoor recreation is enhanced when wildlife is abundant. Wildlife benefits from soil and water conservation practices applied on cropland. Consideration should be given, in assisting landowners in developing soil and water conservation plans for their land, to the planning and installation of additional biology practices on or adjacent to cropland. Practices, such as hedgerow planting, field border planting, and wildlife food and cover planting are applicable on all cropland. Streambank planting can be made. Marshes, farm ponds, and pond area plantings can be installed on most of the fields having dominant or excess water problems. The farm woodlots can be improved for wildlife habitat through proper timberstand improvement and harvest cuttings. These improvements in habitat will benefit wildlife populations.

Programs Available to Help Solve Problems

There are many Federal, State, county and municipal agencies and organizations which have programs that help in solving the problems relating to the conservation and improvement of the agricultural land in the Susquehanna River Basin. All of the land area in the Basin is within soil and water conservation districts. These districts operate under State Law and are supervised by State commissions or committees. One of their main objectives is to work with and encourage local landowners to plan and install soil and water conservation practices through cooperation with Federal and State agencies. Some of the agencies and organizations which have major programs and/or responsibilities in this field are: Soil Conservation Service, Agricultural Stabilization and Conservation Service, Farmers Home Administration, U. S. Fish and Wildlife Service, State Soil and Water Conservation Commissions or Committees, State Conservation Departments, Cooperative Extension Service, Agricultural Experiment Station, State Forests, Waters, and Parks Agencies, State Game and Fish Agencies, State Departments of Highway, County Commissioners, Township Supervisors, Planning Commissions, and other similar agencies or organizations.

Approximately 9.6 million acres or 55 percent of the Basin area is forest land. The forested area in the eight subbasins is shown in Appendix I, page 15, Table 20. Figure 2, on the following page, shows the percent of forest land by subbasins. Approximately 77 percent of the forest land is privately owned. The remaining 23 percent is publicly owned (Table 20).

Relationship of Forest Cover to Watershed Condition

The type of management received by that portion of the Basin in forest cover has significant effect on the quality, quantity, and timing of the runoff from that area. Proper management of forest cover is particularly important on the headwater areas, at the higher elevations, and on the steeper slopes and poor shallow soils.

The influence of the forest cover begins with interception of some of the precipitation. Some of the intercepted precipitation evaporates from the foliage. Impact of the remaining intercepted precipitation upon the soil is broken and softened. The organic layer of litter and humus produced by the forest further absorbs the impact, thereby reducing soil movement. This layer also creates favorable conditions for infiltration and percolation, and provides a bed in which soil structure improving plants and organisms become established.

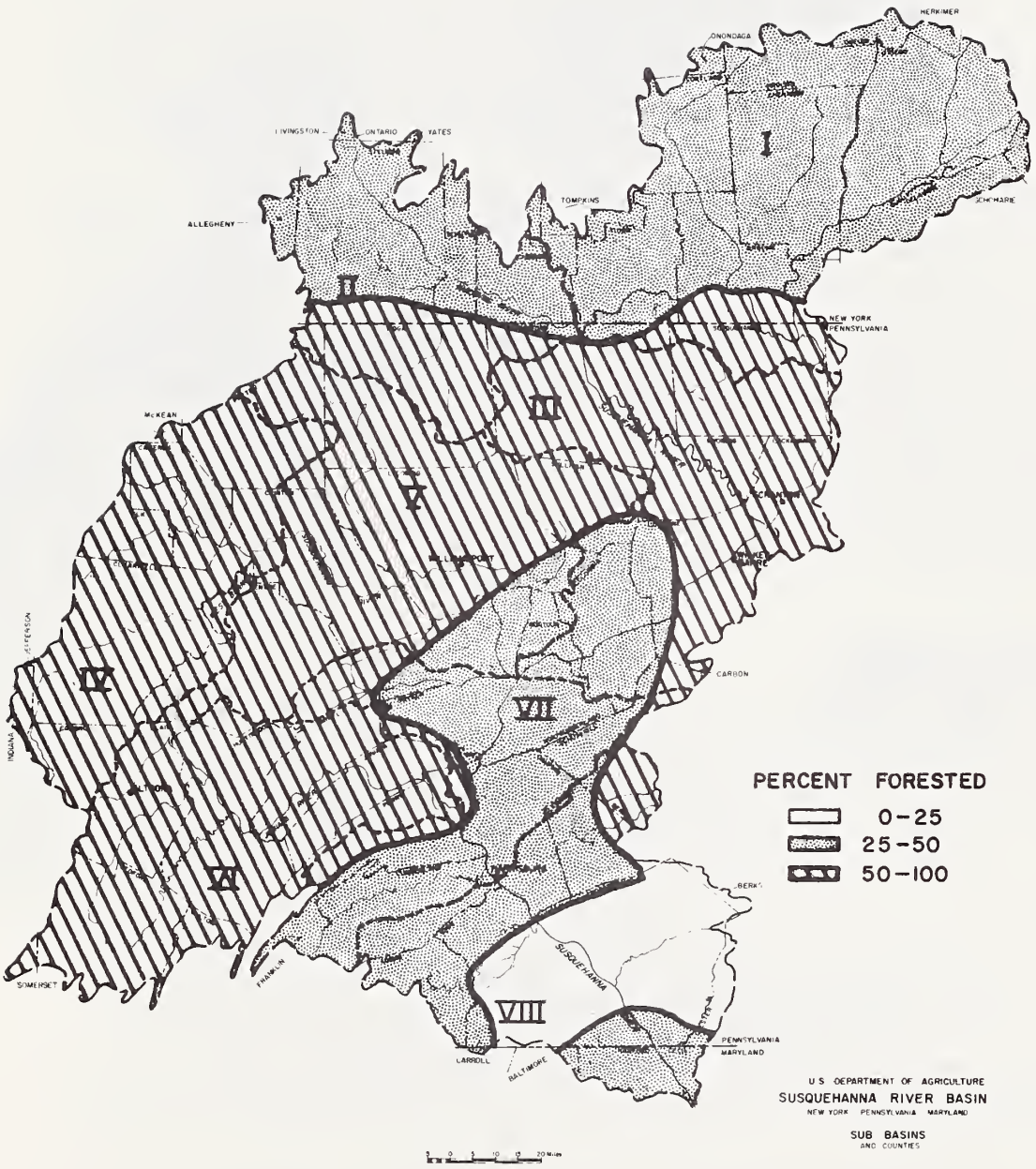
Root systems, living and dead, improve soil permeability. Withdrawal of soil moisture through vegetative processes maintains a soil reservoir for holding precipitation. Physical obstacles in the form of stems, roots, and litter slow down surface runoff and reduce erosion and sedimentation. Concrete frost, impermeable to infiltration, seldom if ever forms in the soil under a forest cover. Snow melt is delayed beyond melt from open areas, desynchronizing peak runoff periods.

Removal of vegetation by cutting, burning, or grazing affects the above relationships. When the organic layer is partially destroyed by fire, it is exposed, and increased air movement and evaporation occur resulting in accelerated oxidation and greater raindrop impact. As a result, the soil surface layer becomes more compact and surface runoff is increased. When logging is involved, poorly located, constructed, and maintained roads may contribute to accelerated erosion. However, forest lands can be so managed, and logging operations so performed, that timber crops can be removed from an area without impairing the production of high quality water, recreation use or wildlife habitat.

Relationship of Forest Land to Recreation

The value of forested land as a place for recreation and a habitat for fish and wildlife is increasing each year. Forests and water are the

FIGURE 2


HERKIMER
ONONDAGA
LIVINGSTON
ONTARIO
YATES
TOMPKINS
SCHUYLER
ALLEGHENY
NEW YORK
PENNSYLVANIA
McKEAN
CLEARFIELD
CARBON
INDIANA
JEFFERSON
SOMERSET
FRANKLIN
SUSQUEHANNA
WYOMING
LYCOMING
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I
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PERCENT FORESTED
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U S DEPARTMENT OF AGRICULTURE
SUSQUEHANNA RIVER BASIN
NEW YORK PENNSYLVANIA MARYLAND
SUB BASINS
AND COUNTIES

focal points of outdoor recreation. The recreation problem today is not one of the amount of area available, but of the effectiveness of the areas that are available. Recreation interests and activities change with time. As mobility continues to increase, more people will travel farther to enjoy outstanding scenic wilderness and natural areas.

About 60 percent of all recreation activities today are not oriented to specific facilities or developed sites. Fishing, hunting, boating, bird watching, hiking, riding, wilderness travel, berry and mushroom picking, mountain climbing, and many other activities spread visitors throughout all of the public and private lands that are not closed to these uses.

The majority of outdoor recreation activities are compatible or can be compatible with other uses. In many cases, multiple use of the resources will actually enhance each of the several uses, especially recreation. Hunting and fishing use is a good illustration of this. The beneficial effects of proper timber harvesting in building up favorable wildlife habitat are well established. Hunting is an effective way to protect big game habitat from overuse. Reforestation to stop erosion of soil from denuded or burned areas has obvious benefits for fish populations dependent upon clean water. Protection of forests from fire, insects, and disease benefits the recreationist in regard to personal safety and esthetic values. Hydrologic stand improvement of the forest land can result in the improvement of wildlife habitat and an increase in the amount of food available for forest wildlife.

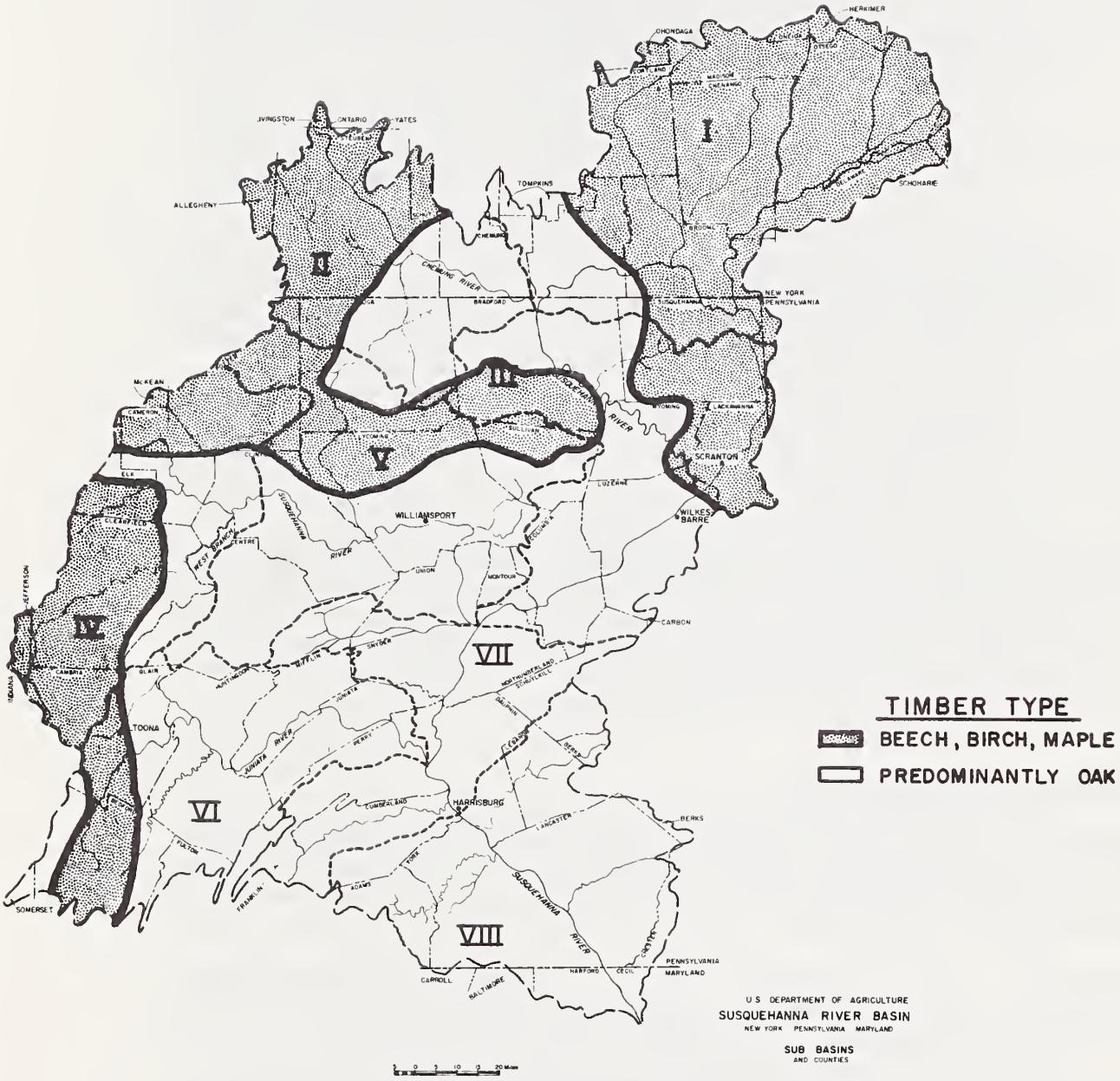
The Timber Resource

The Susquehanna River Basin lies in the Eastern Hardwood Transition Zone. Thus, the southern portion contains species representative of the south; such as, yellow poplar, southern red oak, the gums, and some yellow pines. The northern areas of the Basin contain some species; such as, black cherry, white ash, white pine, hemlock, the maples, beech, basswood, and birches characteristic of northerly areas.

The Basin has a very wide variety of species. The more valuable black cherry, black walnut, yellow poplar, red oak, yellow birch, and ash are not as plentiful as are some of the less valued; such as, red maple, beech, and chestnut oak. Proper management can, however, favor the valuable species at the expense of the less valued. Composition is about 92 percent hardwood, with over 50 percent of the area in the oak or oak-hickory type, and the balance in beech, birch, and maple type (Figure 3).

Most of the timber within the Basin is in stands of small-sized trees usually in the category of medium pole-sized timber to light sawtimber class (Appendix I, page 16, Table 21). Sawtimber size tends to remain consistently small for species of value because they are cut as soon as they are of log size. The less valuable species are left to grow and occupy space that could be converted to the more valuable species.

FIGURE 3


TIMBER TYPE
BEECH, BIRCH, MAPLE
PREDOMINANTLY OAK
U S DEPARTMENT OF AGRICULTURE
SUSQUEHANNA RIVER BASIN
NEW YORK PENNSYLVANIA MARYLAND
SUB BASINS
AND COUNTIES
I
II
III
IV
V
VI
VII
VIII
HERKIMER
ONONDAGA
ONTARIO
YATES
LIVINGSTON
ALLEGHENY
TOMPKINS
SCHOHARIE
NEW YORK
PENNSYLVANIA
CHEMUNG RIVER
BRADFORD
SUSQUEHANNA RIVER
WYOMING
SCRANTON
LUZERNE
MCKEAN
ELK
CLEARFIELD
WILLIAMSPORT
WILKES BARRE
WEST BRANCH
SUSQUEHANNA RIVER
UNION
MONTOUR
CARBON
INDIANA
JEFFERSON
CLARION
BLAIR
HUNTINGDON
SNYDER
NORTHUMBERLAND
SCHUYLKILL
JUNIATA RIVER
PERRY
DAUPHIN
TOONA
CUMBERLAND
HARRISBURG
LANCASTER
BERKS
FULTON
FRANKLIN
ADAMS
YORK
SUSQUEHANNA RIVER
SOMERSET
CARROLL
BALTIMORE
HARFORD
CECIL
PENNSYLVANIA
MARYLAND

Although the Basin is well covered with quantities of timber, the quality can be greatly improved. Approximately one-fourth of the hardwood sawtimber will produce logs of medium grade or better. There is an excellent opportunity to improve the grade of the remainder through proper management. In the category of softwood sawlogs, the situation is much better. Two-thirds of the softwood logs will produce common and better-grade lumber. Hardwoods, because of the greater quantities, offer the best chance for future development.

Size, species, and quality of available timber are among the factors that determine the potential for development of timber-based industries.

From the turn of the century up until the last decade, there has been a steady decline in timber production within the Basin. This decline, combined with a steady increase in forest land area, has resulted in an imbalance in the ratio of growth to harvest of timber. At the present time, the annual harvest of timber is slightly more than one-third of annual growth. This may at first appear to be a favorable situation. Growth in excess of harvest will tend to build up growing stock. A level of demand for small sizes and inferior species is needed to improve the quality of the growing stock by removal of the less desirable trees.

The fact that cut is far exceeded by growth does not imply that more timber of a given species, quality, or size is grown each year than is needed or can be consumed. For example, substantially more softwood is cut yearly than is grown. Also, much hardwood that is of merchantable size is left standing because its poor quality makes it unmerchantable. Good quality lumber always finds a market; conversely, markets are hard to find for poor quality merchandise.

Forest Land Treatment Needs

Hydrologic improvement of the 9.6 million acres of forest land in the Basin is needed and can be reached only through a cooperative effort by all interested Federal, State, and municipal agencies, private groups, and wood-using industries.

Appendix I, page 17, Table 22 shows the estimated total acreage of treatment needed by subbasins. Appendix I, page 18, Table 23 shows the estimated total acreages of treatment needed by states.

The following forest land management practices would accomplish the needed improvement in addition to contributing to the economic development of the Basin:

Fire Control

Protection of the forest land from damage or destruction by fire is essential to secure maximum benefits in water, timber, recreation facilities, and wildlife habitat. Over the past 30 years,

the yearly acreage burned in the Basin has been reduced about 75 percent. The average number of fires per year has been reduced more than 50 percent. This has been brought about through a combination of improvement of all State fire fighting organizations and the cooperation of the citizens in preventing fires. At present, adequate fire protection is provided by the State Forestry agencies of New York, Pennsylvania, and Maryland in cooperation with the U. S. Forest Service under the Clarke-McNary Cooperative Fire Control Program. Cooperative agreements with local fire departments have been a key factor in fire control in late years. The present favorable situation should not be viewed with complacency. It requires the continued support of the State agencies and the residents of the Basin. Water resource groups should lend their active support to this program which is vital to the water resource. Drought, changes in land use, and changes in hazards and risk factors may require an acceleration of present programs, in which case, benefits accruing to water interests may justify direct financial support by such interests.

Reforestation

Changes in land use over the past several years have resulted in thousands of acres within the Basin being converted to plantations of one kind or another. Abandonment of farmland on the Allegheny Plateau is taking place rapidly. Many cut-over areas have failed to regenerate themselves and have had to be reforested through planting. Reforestation will have to be continued in the future. It is estimated that, at the present time, the Basin contains nearly 150,000 acres in need of this treatment. Projections indicate that an additional 62,000 acres will be converted to forest between now and the year 2020.

Grazing Control

Field examinations indicate that there are a total of 891,000 acres of forest land within the Basin which need protection from grazing. A large share of this is protection from grazing of domestic animals. There are also many areas that have been damaged through heavy concentrations of deer.

Insect and Disease Control

State and Federal agencies are conducting a cooperative program of insect and disease control in the forested area of the Basin. At the present time, the chief concern is a rather serious outbreak of several hardwood defoliators which has developed in Subbasins II, III, IV, and V over the past few years. The 1965 outbreak was one of the most severe experienced in the northern hardwoods of Pennsylvania and resulted in heavy to complete defoliation of over one-half million acres of forest land. All species of hardwoods in the area were affected, including the more valuable species; such as, sugar maple, black cherry, and ash.

Erosion Control

It is estimated that approximately 53,000 acres of forest land within the Basin are in need of tree planting for erosion control. This is in addition to the area previously discussed under "Reforestation." This acreage is made up mainly of understocked, formerly cleared land, that is severely eroded. (Strip-mined areas are treated in a separate section.) On poorly located and constructed logging roads, mine access roads, and skid trails, water disposal measures are needed to control erosion.

Hydrologic Stand Improvement

Hydrologic stand improvement work is needed on a total of approximately five million acres of forest land in the Basin. Some of the measures needed are thinnings, weedings, sanitation cuts and pruning. These operations will improve hydrologic condition of the stands and at the same time benefit the future timber-based economy and recreation values of the Basin.

Protection from Improper Cutting Practices

There are over 6.2 million acres of forest land within the Basin that need protection from improper cutting practices. Technical assistance provided to private landowners by State forestry organizations in cooperation with Forest Service should be expanded to meet this need.

Existing Projects and Programs

There are many Federal, State, county, municipal and cooperative programs that can facilitate the installation of the recommended treatments. Some of these are listed as follows:

1. All states within the Basin have conservation agencies with various programs which deal with one or more of the existing problems.

2. All states within the Basin have cooperative U. S. Forest Service - State programs in fire control, forest management, reforestation, insect and disease control and watershed management.

3. The USDA Agricultural Conservation Program provides cost sharing to private landowners for the installation of approved practices.

4. Watershed research is being continued by the U. S. Forest Service in cooperation with several State departments, universities, municipalities, and private companies.

Approximately 23 percent of the forest land within the Basin is publicly owned (Table 20). A large percent of this is owned by the states,

some by counties, and a small amount by municipalities. All of these areas will eventually receive the needed treatments. The 77 percent of privately-owned forest land must receive treatment through the use of private funds or funds provided through State programs or one of the cooperative programs mentioned above. Most of these cooperative programs must be supplemented by a substantial amount of private money before the job is accomplished. Technical assistance through advice and planning is available for most of these cooperative programs.

Appendix I, page 19, Table 24 indicates that present programs will fail to meet any meaningful amount of the needs by 1985. This is especially true regarding such practices as Protection from Grazing, Protection from Overcutting, and Hydrologic Improvement Work. Strip-mine rehabilitation work in areas disturbed previous to 1945 will not advance rapidly under present programs. If the hydrologic condition of the forest lands is to be improved, present programs will have to be accelerated. One way to accelerate the present cooperative programs would be to establish an 80 percent Federal, 20 percent State contribution for technical assistance financing and an 80 percent Federal, 20 percent private financing ratio for installation of approved practices.

A hydrologic evaluation of the forest land indicates that it has a medium to high potential to improve hydrologically. Physical benefits to be derived from the proposed forest land treatment program include increased rates in infiltration of precipitation with resulting reduction of runoff. This will in turn supplement structural flood control measures, reduce soil movement, and improve water quality. Table 2, following, indicates by subbasins the reductions in runoff and erosion that will be realized as a result of the proposed program.

TABLE 2

Benefits to be Derived from the Proposed Forest Land Treatment Program

Subbasin	Surface Runoff Reduction 1/ Inches	Percent	Erosion Reduction 2/ Tons/Sq. Mi./Yr.	Percent
I	.35	7	44.8	25
II	.32	8	38.4	19
III	.35	7	44.8	21
IV	.12	3	57.6	28
V	.13	3	44.8	24
VI	.42	9	64.0	32
VII	.34	8	32.0	20
VIII	.38	8	38.4	22
Average	.28	--	44.8	--

1/ Based on 100-yr. frequency storm of 4-day duration. Reference Tech. Paper No. 49 - Weather Bureau and Tech. Release No. 16-SCS.
2/ Computed using Musgrave's Soil Loss Prediction Formula.

Additional benefits that will be realized from this planned program will be the enhancement of natural beauty and wildlife habitat, creation of more pleasant environment in which to live and play, and expansion of the economy through an increase in the production and quality of raw materials for the wood products industries.

The Economic Research Service has analyzed the future land requirements for urban areas of more than 2500 in population and two selected other land uses: highways and water-oriented recreation areas. The agricultural economy of the Susquehanna River Basin Report was used as a basis for determining these land use requirements. Projected trends for these three categories of land use serve to illustrate the size and scope of land treatment needed for 1985. Neither sufficient base data nor time was available to fully analyze future land requirements for all other types of nonagricultural uses on a specific basis.

Nonagricultural land, as used in this report, includes (1) urban areas of more than 2500 in population and (2) other land not used for cropland, pasture, or forest land.

Land Requirements for Urban and Selected Other Land Uses

By 1985, 496,800 additional acres of land will be required for urban, highways, and water-oriented recreation areas in the Susquehanna River Basin. Land to meet these needs will come primarily from existing crop, pasture, and forest land (Table 4, page 24).

The capability of the land in the Susquehanna River Basin to produce its share of agriculture products for the future is directly affected by the quantity and quality of available land. The increasing population in the Basin is the most significant factor affecting the availability of agricultural land. It is anticipated that a major part of the land required for nonagricultural uses will be taken directly from those lands best suited for agricultural use. Moderate slopes, good drainage, and minimum vegetative cover are characteristics of good agricultural land which result in low construction cost. In many cases, the savings in construction costs exceed the additional cost of these more productive lands. This cost advantage often results in the selection of the better lands for nonagricultural or urban development.

Urban Land Requirements

By 1985, it is estimated that the urban land of the Basin will increase by 222,400 acres. This estimate is based on published U. S. Census land to population ratios. In Subbasins I through V, 173 acres of land per 1,000 urban population reflects the rural character of this portion of the Basin as compared to 94 acres per 1,000 population in Subbasins VI through VIII.

Pennsylvania's new Sewage Facilities Act will influence both the quantity and quality of land required for urban uses in areas not served by municipal sewers. One provision of the Act regulates the installation of on-site sewage disposal systems on areas less than one acre in size. On-site sewage disposal systems will be permitted only on areas having favorable soil

properties for such systems. As a result, future homesite development will use the better agricultural lands which have slight limitations for sewage disposal or lot sizes will increase to one acre or more in size to avoid the requirements of the Act. New York State's recent bond issue on water pollution control will also affect future water quality sewage disposal in much the same manner as Pennsylvania's legislation.

Highway Land Requirements

By 1985, approximately 162,300 acres will be needed for expanding the highway network within the Basin. This estimate is based on the present average quantity of land required for local, State, and Federal highways, which is 6.3 acres per mile of highway. The average ratio of miles of highway to population was found to be 15 miles per 1,000 for those counties in Pennsylvania selected to approximate the Basin area. This, translated into a ratio of acreage to population, amounts to 95 acres per 1,000 population.

Construction of all highways and roads within Pennsylvania has amounted to 2,300 miles or approximately 13 miles per 1,000 population increase during the period 1960-1965. Assuming that the New York part of the Basin would have construction rates similar to Pennsylvania, it is estimated that construction during the next 20 years would amount to 15 miles per 1,000 population. This is based on the assumption that after a rapid construction rate during the next ten years, there would be a considerable decrease during the second ten-year period. After primary and secondary highways are substantially complete, the demand of an increasing population will be met, in large part, by construction of spurs, access roads, and improvement of present facilities. These types of improvement require a minimum of additional land. Therefore, this construction rate was assumed to decrease to seven miles per 1,000 population growth.

Water-Oriented Recreation Land Requirements

By 1985, an additional 112,100 acres will be needed to supply demands for water-oriented recreation land according to estimates by the Bureau of Outdoor Recreation (Table 3).

TABLE 3

Water-Oriented Recreation Land Requirements by Subbasin, 1985

Subbasins	1985 (Acres)
I	13,100
II	6,700
III	12,800
IV	5,900
V	4,500
VI	800
VII	38,800
VIII	29,500
TOTAL	112,100

The above requirements reflect the amount of land needed to support recreational activities directly related to water surface areas such as boating. The increase in population 1964-1985 and the percent of population expected to participate in water-oriented recreation was used to determine the amount of additional surface water requirements. After the additional surface water requirements were known, a ratio of three acres of land to one acre of water was used to estimate the amount of recreation land required.

Source of Land to Meet Urban and Other Nonagricultural Land Uses

Land use changes must take place to meet the additional nonagricultural land requirements by 1985. Through the period 1964 to 1985, 496,800 acres of land will shift from crop, pasture, forest and other uses to urban, highway, and water-oriented recreation uses. The projected population increase 1964-1985 was used as the basis for determining the additional land requirements for these nonagricultural uses. Additional land required for urban, highway, and water-oriented recreation uses is expected to be composed of about 56 percent crop and pasturelant and 44 percent forest and other land. This would amount to a shift of 281,400 acres from crop and pastureland to nonagricultural uses and a shift of 215,400 acres from forest and other land to nonagricultural uses (Table 4).

TABLE 4

Land Use Changes to Meet Selected Nonagricultural Needs

Selected Nonagricultural Needs, 1985	Acres
Urban	222,400
Highways	162,300
Water-Based Recreation Land	112,100
Total	496,800
Expected Sources to Meet Needs	**Acres**
Crop and Pasture Land	281,400
Forest and Other Land	215,400
Total	496,800

Data from the Conservation Needs Inventory was used to estimate the capability of crop and pastureland which will be taken for nonagricultural uses. These estimates are given by land class and/or subclass within each of the counties (Appendix I, page 1, Table 5). The estimates considered physical capability of each land group, past and present land use, trends, and technological changes.

Agricultural Land Ratio

The ratio of crop and pastureland to urban, forest, and other land is expected to decline by 50 percent from 1:2 in 1964 to 1:4 in 1985. Crop and pastureland will likely decline from 5.8 million to 3.3 million acres. This shift in agricultural land use will be into forest, urban, and other categories. Approximately 310 thousand acres were estimated to transfer to forest, 222 thousand to urban, and 1,944 thousand acres into other land use. This latter amount includes land in transition from crop and pastureland to other uses. This category includes airports, railroads and marshalling yards, industrial parks, shopping centers, etc., not in incorporated limits of urban areas. Urban, forest, and other land will increase from 11.6 million acres in 1964 to approximately 14.1 million in 1985.

Land Treatment Needs

Erosion, excess water, and unfavorable soil conditions are problems on the nonagricultural land. The Soil and Water Conservation Needs Inventory indicates that treatment has been applied or is not feasible on 990,240 acres. Treatment is needed to protect and improve the remaining 191,710 acres, not including strip-mined areas, as shown in Appendix I, page 20, Table 25. Establishment and maintenance of adequate cover is probably the most important measure that can be used to protect these types of land. Applicable erosion control, water disposal, and flood prevention measures can also be installed to help alleviate these problems. No effort was made to develop land treatment costs and a time table for installation of land treatment measures for these types of land.

Urban Development

Unprotected urban construction sites produce large amounts of sediment. When large areas of land are stripped of all cover and left unprotected for long periods during construction, large amounts of sediment are produced. Erosion and sediment damage can be reduced by developing these areas in stages, constructing temporary diversions, sediment traps and debris basins in critical areas, and by seeding the disturbed areas to temporary or permanent grasses, legumes, or other suitable vegetation as soon as possible.

Roadside Erosion

The three State Highway Departments have done a good job in stabilizing highway rights-of-way through vegetative and structural means. Erosion does occur where cut or fill slopes and drainage ditch grades are too steep to permit establishment of permanent grass cover. Drainage from highway culverts causes gullying on adjacent land where drainageways are not stabilized. Clearing or enlarging highway drainage ditches removes the protective grass cover and creates sources of sediment. Sediment from these sources is deposited in or around culverts or in streams. These

problems can be and are being reduced by regrading steep slopes, use of structural measures, and the establishment or reestablishment of cover on steep slopes and in drainage ditches and drainageways.

Highway Construction

Runoff and erosion from the construction of new highways produces large amounts of sediment until the areas are stabilized by vegetation or by structural means. Drainage from new highway culverts causes an excessive amount of gullying on adjacent land until the drainageways are stabilized. This is especially true of interstate highway construction. The use of temporary desilting or debris basins in critical areas would help alleviate the problem. More stringent contract requirements would also be helpful in reducing this problem.

Bedload Deposition

Excessive bedload deposition is a problem on many of the tributary streams in the Basin. The major source of this material is from streambank erosion and from deposits already present in the channels. Excessive deposits of cobble, gravel, and other coarse textured material around bridges and culverts or in the channels, such as sand and gravel bars, are common in the glaciated areas, especially in New York State. This problem is also found to a lesser degree throughout the Basin. Accumulations of these deposits restrict water movement, cause minor flooding, and destroy fish spawning and fish food organism habitat. Streambank stabilization and the use of structural measures may help reduce this problem. However, the use of these measures is costly and the damage may not justify their use. A temporary solution to this problem is the complete removal of the material; however, this is detrimental to fish life. Programs available to help solve the problems and the need for acceleration of these programs are similar to those indicated on page 10.

Mine Spoil Areas

Mining has created many problems in the Susquehanna River Basin, especially in Pennsylvania. These problems result primarily from strip mining for anthracite and bituminous coal, culm piles and culm material resulting from deep mining of anthracite and bituminous coal, and from surface mining for stone, clay, sand, gravel, or other minerals. Mining operations have left the landscape unattractive and unproductive in most cases.

The Pennsylvania Legislature passed a Bituminous Coal Open Pit Mining Conservation Act in 1945 and an Anthracite Strip Mining and Conservation Act in 1947, which require reclamation of areas stripped for coal by backfilling and planting to trees, shrubs, or grasses and legumes. These acts were amended several times between 1945 and 1963 to improve their effectiveness. The Conservation Acts are administered by the Pennsylvania Department of

Mines and Mineral Industries. Compliance with the present acts should correct the problems on areas stripped for coal except where planting and seeding failures may occur. The major problems occur on the following areas:

1. Areas stripped for bituminous coal prior to 1945 and anthracite prior to 1947.

2. Areas stripped for bituminous coal after 1945 and anthracite after 1947 where planting and seeding failures occurred.

3. Areas of culm piles and culm material.

4. Areas surface mined for stone, clay, gravel, or other minerals.

There are about 123,700 acres of these problem strip-mine coal spoil areas in the Basin. The 119,700 acres stripped before the passage of the Conservation Acts are for the most part ungraded. There are more than 4,000 acres stripped after the passage of the Conservation Acts which are graded but where planting and seeding failures have occurred. These areas are bare or sparsely covered with vegetation that has seeded naturally. This is especially true of the more acid spoil areas. They are subject to excessive runoff and erosion. Silt from eroded areas has, in some cases, choked small streams and turned clear waters muddy. Where the overburden was acid, streams were polluted further with chemicals.

These strip-mined areas can be made suitable for a variety of uses that can contribute economic values to both the landowner and the general public. Basic reclamation for spoil stabilization, erosion control, and water quality should be the primary goal. Reforested areas can add to the existing wood supply for wood-using industries. Areas vegetated with trees, shrubs, grasses, and legumes can provide food and cover for wildlife. Some of the areas may offer opportunities for developing water impoundments. Some leveling and backfilling may be desirable. The extent of backfilling and leveling will depend on the problem, location of the spoil, and the use to be made of the spoil area. Most of the spoil can be revegetated without leveling. Some of these spoil areas have been reclaimed for uses; such as, industrial sites, housing developments, home sites, shopping centers, parks and playgrounds.

There are more than 22,500 acres of deep-mine culm piles and culm material in the Basin. Most of these areas are located near streams. The material is generally fine since much of it resulted from the washing of coal. This material supports very little vegetation, is easily eroded and contributes more sediment on a per acre basis to streams than any other source. Reclamation is usually difficult and costly.

One of the first considerations in trying to correct or alleviate this problem is to determine whether this material can be used for some purpose and to what extent. Some possible uses that might be considered are material for road construction and maintenance, fill for abandoned strip-mine pits and deep mines, fill for swampy or low areas, fill material for industrial or other similar sites, fuel, and as a substitute for sand and cinders used on highways during the winter. Any use that disposes of the material would reduce the size of the problem.

About 25,000 acres have been surface-mined for stone, clay, sand, gravel or other minerals. Many of the areas are ungraded and bare or sparsely covered with vegetation. These areas are usually small and scattered. Locally, large amounts of sediment may be produced in the washing of sand and gravel. Runoff and erosion from areas stripped for clay and sand also produce sediment.

It is estimated that about 75 percent of the strip and surface-mined areas should be planted to trees and shrubs for forestry and wildlife use. A cover crop should be used in conjunction with the trees and shrubs on eroded areas. Approximately 15 percent should be planted to grasses and legumes for cover and wildlife. About 10 percent will probably be used for various types of urban and community development.

A reclamation plan should be developed for each of the problem areas in accordance with the needs and desired use. Strip-mined areas should be planned on a watershed basis. These plans should include specific recommendations for revegetating, leveling, installing structures, stabilizing roads, controlling erosion, managing storm water, and installing access roads. The reclamation plans for the culm piles and culm areas will probably need to be more detailed because of the nature of the problem. The Federal and State agencies concerned with these problems have developed guides, methods, and procedures which would be applicable in revegetating, stabilizing, backfilling, and leveling most of these areas.

If these areas are stabilized and covered with suitable vegetation, the esthetic values of the Basin's picturesque landscape would be recaptured. This would be helpful in attracting new industries and tourists. A permanent cover of vegetation would retard runoff and erosion and minimize stream pollution by sediment and acid drainage, thereby improving the water quality in the Basin.

Federal cooperation with States, counties, townships, boroughs or other municipalities, industry, and private individuals will undoubtedly be needed in developing and carrying out a reclamation program for these problem areas. The estimated per acre cost for installation of vegetative, critical area stabilization measures varies from $45 to $100, depending on the intensity of treatment needed. Leveling and structural measures are not included in this cost estimate. The Federal government should assume 80 percent of the installation cost and non-Federal interests 20 percent.

A P P E N D I X I

TABLES OF BASIC DATA

TABLE 5

Acreage in Each Land Use by Land Capability Classes**

SUB-BASIN	Land Capability Class	Cropland	Pasture	Forest	Other Land	Urban	Total Land Area
I	I	53,180	9,510	6,240	2,175	-	71,105
	II	237,660	85,915	125,925	48,955	-	498,456
	III	269,475	193,640	260,985	103,060	-	827,160
	IV	128,305	141,365	237,830	66,995	-	574,495
	V	-	-	-	-	-	-
	VI	33,880	174,165	532,270	63,115	-	803,430
	VII	5,355	45,715	213,900	17,430	-	282,400
	VIII	-	175	3,680	650	-	4,505
	*	95	275	470	2,010	92,240	95,090
	TOTAL	727,950	650,760	1,381,300	304,390	92,240	3,156,640
II	I	20,950	2,060	2,720	3,060	-	28,790
	II	109,650	19,950	56,840	15,810	-	202,250
	III	204,525	93,000	163,250	50,315	-	511,090
	IV	87,350	90,665	179,990	52,855	-	410,860
	V	-	-	-	-	-	-
	VI	28,235	41,240	127,670	22,615	-	219,760
	VII	6,030	23,830	177,880	11,155	-	218,895
	VIII	90	175	6,180	260	-	6,705
	*	330	-	20	1,610	47,220	49,180
	TOTAL	457,160	270,920	714,550	157,680	47,220	1,647,530
III	I	20,310	2,325	5,990	2,460	-	31,085
	II	192,630	21,475	69,335	41,400	-	324,840
	III	216,155	64,125	95,845	52,425	-	428,550
	IV	62,680	65,500	231,150	35,125	-	394,455
	V	-	-	-	-	-	-
	VI	11,460	20,755	418,387	10,735	-	461,337
	VII	6,470	17,690	416,185	12,060	-	452,405
	VIII	125	780	32,155	665	-	33,725
	*	540	-	21,065	21,040	171,300	213,945
	TOTAL	510,370	192,650	1,290,112	175,910	171,300	2,370,342
IV	I	2,960	290	5,540	830	-	9,620
	II	60,540	6,570	285,190	15,920	-	368,220
	III	49,570	10,610	202,390	19,065	-	281,635
	IV	18,495	7,520	131,290	16,510	-	173,815
	V	10	-	-	-	-	10
	VI	8,605	3,615	373,590	6,215	-	392,025
	VII	1,860	1,960	413,410	4,430	-	421,660
	VIII	-	-	21,350	1,610	-	22,960
	*	330	195	151,180	11,670	44,990	208,365
	TOTAL	142,370	30,760	1,583,940	76,250	44,990	1,878,310
V	I	17,530	1,930	8,265	1,920	-	29,645
	II	180,780	22,520	178,050	22,260	-	403,610
	III	93,640	23,830	119,400	33,370	-	270,240
	IV	58,715	12,260	94,520	23,510	-	189,005
	V	40	-	-	-	-	40
	VI	28,335	8,250	512,218	16,160	-	564,963
	VII	14,020	12,640	932,590	19,670	-	978,920
	VIII	40	100	56,245	5,810	-	62,195
	*	-	150	-	340	70,680	71,170
	TOTAL	393,100	81,680	1,901,288	123,040	70,680	2,569,788
VI	I	7,310	695	3,905	735	-	12,645
	II	131,390	52,455	82,415	16,165	-	282,425
	III	87,280	24,775	119,280	12,110	-	243,445
	IV	122,190	30,935	154,470	18,265	-	325,860
	V	-	80	1,450	-	-	1,535
	VI	62,680	17,480	445,790	16,665	-	542,615
	VII	26,080	26,255	479,380	12,055	-	543,740
	VIII	-	-	151,620	80	-	151,700
	*	-	-	5,030	5,985	82,200	93,215
	TOTAL	436,900	122,680	1,443,340	82,060	82,200	2,167,180
VII	I	12,915	770	1,855	660	-	16,200
	II	152,300	17,175	37,210	17,425	-	224,200
	III	89,795	13,270	56,775	11,370	-	171,210
	IV	75,835	14,250	44,000	13,940	-	148,025
	V	-	-	95	-	-	95
	VI	46,640	8,905	212,075	15,305	-	282,925
	VII	25,945	11,850	305,820	19,705	-	363,320
	VIII	70	10	51,240	3,435	-	54,755
	*	120	-	5,880	20,940	82,650	109,590
	TOTAL	403,710	66,230	714,950	102,780	82,650	1,370,320
VIII	I	41,365	10,495	5,005	2,205	-	59,070
	II	542,630	82,425	78,085	48,090	-	751,230
	III	246,145	53,095	72,360	32,160	-	403,760
	IV	179,740	50,625	70,450	30,995	-	331,810
	V	1,710	1,640	3,060	315	-	6,725
	VI	56,515	30,475	254,760	21,340	-	363,390
	VII	17,055	12,585	152,550	11,045	-	193,235
	VIII	20	360	6,210	705	-	7,295
	*	80	-	1,040	12,985	146,400	160,505
	TOTAL	1,085,560	241,700	643,520	159,840	146,400	2,277,020
Entire Basin	I	176,520	28,075	39,520	14,045	-	258,160
	II	1,807,370	278,485	913,050	226,025	-	3,025,230
	III	1,256,585	476,345	1,090,285	313,875	-	3,137,090
	IV	733,310	413,120	1,143,700	258,195	-	2,548,325
	V	1,760	1,720	4,605	315	-	8,405
	VI	276,650	304,880	2,876,760	172,150	-	3,630,445
	VII	102,785	152,525	3,091,715	107,550	-	3,454,575
	VIII	345	1,600	328,680	13,215	-	343,840
	*	1,495	620	184,685	76,580	737,680	1,001,060
	TOTAL	4,157,120	1,657,380	9,673,000	1,181,950	737,680	17,407,130

* Area reported without a land capability classification. ** Source - Soil and Water Conservation Needs Inventory - 1964.

TABLE 6

Land Use, Susquehanna River Basin by Subbasin, 1964

Subbasin	Cropland	Pasture	Forest	Urban	Other	Total Land Area
I	727,950	650,760	1,381,300	92,240	304,390	3,156,640
II	457,160	270,920	714,550	47,240	157,680	1,647,550
III	510,370	192,650	1,290,110	171,310	175,880	2,340,320
IV	142,370	30,760	1,583,940	45,010	76,260	1,878,340
V	393,100	81,680	1,901,290	70,670	123,020	2,569,760
VI	436,900	122,680	1,443,340	82,200	82,060	2,167,180
VII	403,710	66,230	714,950	82,610	102,800	1,370,300
VIII	1,085,560	241,700	643,520	146,400	159,860	2,277,040
TOTALS	4,157,120	1,657,380	9,673,000	737,680	1,181,950	17,407,130

TABLE 7

Land Use, Susquehanna River Basin by Subbasin, 1985

Subbasin	Cropland	Pasture	Forest	Urban	Other	Total Land Area
I	435,000	441,000	1,455,000	123,000	702,000	3,156,000
II	147,000	241,000	817,000	63,000	380,000	1,648,000
III	144,000	173,000	1,340,000	212,000	472,000	2,341,000
IV	81,000	80,000	1,606,000	52,000	59,000	1,878,000
V	266,000	69,000	1,932,000	94,000	208,000	2,569,000
VI	136,000	18,000	1,453,000	100,000	460,000	2,167,000
VII	320,000	40,000	730,000	115,000	165,000	1,370,000
VIII	638,000	109,000	650,000	201,000	680,000	2,278,000
TOTALS	2,167,000	1,171,000	9,983,000	960,000	3,126,000	17,407,000

TABLE 8

Dominant Problem	Estimate of Need for Treatment on Cropland - 1964								
	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat
	SUBBASIN I			SUBBASIN II			SUBBASIN III		
Land with No Problems	66,810	66,810	-	22,330	22,330	-	25,480	25,480	-
Erosion	458,990	177,180	281,810	316,290	80,890	235,400	378,470	148,910	229,560
Excess Water	153,140	58,060	95,080	113,290	38,305	74,985	75,150	32,270	42,880
Unfavorable Soil Conditions	48,010	20,330	28,680	5,250	3,730	1,520	31,270	18,205	13,065
TOTAL	727,950	322,380	405,570	457,160	145,255	311,905	510,370	224,865	285,505
	SUBBASIN IV			SUBBASIN V			SUBBASIN VI		
Land with No Problems	4,570	4,570	-	32,820	32,820	-	12,510	12,510	-
Erosion	118,780	34,210	84,570	299,450	83,640	215,810	351,585	103,945	247,640
Excess Water	13,300	5,170	8,130	45,550	17,070	28,480	38,295	15,325	22,970
Unfavorable Soil Conditions	5,720	3,400	2,320	15,280	8,940	6,340	34,510	16,550	17,960
TOTAL	142,370	47,350	95,020	393,100	142,470	250,630	436,900	148,330	288,570
	SUBBASIN VII			SUBBASIN VIII			TOTAL BASIN		
Land with No Problems	14,510	14,510	-	59,585	59,585	-	238,615	238,615	-
Erosion	332,440	85,690	246,750	941,640	205,950	735,690	3,197,645	920,415	2,277,230
Excess Water	36,500	15,140	21,360	69,280	29,040	40,240	544,505	210,380	334,125
Unfavorable Soil Conditions	20,260	9,180	11,080	15,055	6,485	8,570	176,355	86,820	89,535
TOTAL	403,710	124,520	279,190	1,085,560	301,060	784,500	4,157,120	1,456,230	2,700,890

TABLE 9

Estimate of Need for Treatment on Pastureland, 1964

Treatment and Problem	Subbasin I	Subbasin II	Subbasin III	Subbasin IV	Subbasin V	Subbasin VI	Subbasin VII	Subbasin VIII	Total Acres
Total Area-Acres	650,760	270,920	192,650	30,760	81,680	122,680	66,230	241,700	1,657,380
No Treatment Needed or Not Feasible to Treat	295,010	112,200	75,540	8,050	23,590	32,880	20,620	99,130	667,020
Treatment Needed	355,750	158,720	117,110	22,710	58,090	89,800	45,610	142,570	990,360
Type of Treatment Needed:									
Establishment, Reestablishment or Improvement of Vegetation	349,145	121,405	104,550	21,010	51,190	81,960	42,680	130,550	902,490
Protection of Vegetation from:									
Overgrazing, Erosion, or Encroachment of Plants	101,213	37,577	6,880	2,240	7,710	9,230	2,890	19,770	187,510
Excess Water	59,180	15,570	38,240	3,940	8,180	14,040	10,560	40,270	189,980

TABLE 10

Cropland Treatment Program Timetable

Dominant Problem	Total Acreage Needing Treatment as of 1964	Total Acreage Treated as of 1964	Total Acreage Remaining to be Treated after 1964	Estimated Acreage to be Treated 1964 -- 1985 Present Programs	Estimated Acreage of Accelerated Treatment to 1985 1/	Acreage Needing Treatment after 1985
			SUBBASIN I			
No or Minor Problems	66,810	66,810	-	-	-	-
Erosion	458,990	177,180	281,810	154,996	30,999	95,815
Excess Water	153,140	58,060	95,080	57,048	11,410	26,622
Unfavorable Soil Conditions	49,010	20,330	28,680	20,076	4,015	4,589
Subtotal	727,950	322,380	405,570	232,119	46,424	127,027
			SUBBASIN II			
No or Minor Problems	22,330	22,330	-	-	-	-
Erosion	316,290	80,890	235,400	129,470	25,894	80,036
Excess Water	113,290	38,305	74,985	44,991	8,998	20,996
Unfavorable Soil Conditions	5,250	3,730	1,520	1,064	213	243
Subtotal	457,160	145,255	311,905	175,525	35,105	101,275
			SUBBASIN III			
No or Minor Problems	25,480	25,480	-	-	-	-
Erosion	378,470	148,910	229,560	126,258	25,251	78,051
Excess Water	75,150	32,270	42,880	25,728	5,146	12,006
Unfavorable Soil Conditions	31,270	18,205	13,065	9,146	1,829	2,090
Subtotal	510,370	224,865	285,505	161,132	32,226	92,147
			SUBBASIN IV			
No or Minor Problems	4,570	4,570	-	-	-	-
Erosion	118,780	34,210	84,570	46,514	9,303	28,753
Excess Water	13,300	5,170	8,130	4,878	976	2,276
Unfavorable Soil Conditions	5,720	3,400	2,320	1,624	325	371
Subtotal	142,370	47,350	95,020	53,016	10,604	31,400
			SUBBASIN V			
No or Minor Problems	32,820	32,820	-	-	-	-
Erosion	299,450	83,640	28,480	17,088	3,418	7,974
Unfavorable Soil Conditions	15,280	8,940	6,340	4,438	888	1,014
Subtotal	393,100	142,470	250,360	140,221	28,045	82,364
			SUBBASIN VI			
No or Minor Problems	12,510	12,510	-	-	-	-
Erosion	351,585	103,945	247,640	136,202	27,240	84,198
Excess Water	38,295	15,325	22,970	13,782	2,756	6,432
Unfavorable Soil Conditions	34,510	16,550	17,960	12,572	2,514	2,874
Subtotal	436,900	148,330	228,570	162,556	32,510	93,504
			SUBBASIN VII			
No or Minor Problems	14,510	14,510	-	-	-	-
Erosion	332,440	85,690	246,750	135,712	27,142	83,896
Excess Water	36,500	15,140	21,360	12,816	2,563	5,981
Unfavorable Soil Conditions	20,260	9,180	11,080	7,756	1,551	1,773
Subtotal	403,710	124,520	279,190	156,284	31,256	91,650
			SUBBASIN VIII			
No or Minor Problems	59,585	59,585	-	-	-	-
Erosion	941,640	205,950	735,690	404,629	80,926	230,135
Excess Water	69,280	29,040	40,240	24,144	4,829	11,267
Unfavorable Soil Conditions	15,055	6,485	8,570	5,999	1,200	1,371
Subtotal	1,085,560	301,060	784,500	434,772	86,955	262,773
			BASIN TOTAL			
No or Minor Problems	238,615	238,615	-	-	-	-
Erosion	3,197,645	920,415	2,277,230	1,252,476	250,494	774,260
Excess Water	544,505	210,380	334,125	200,475	40,096	93,554
Unfavorable Soil Conditions	176,355	86,820	89,535	62,675	12,535	14,325
Basin Total	4,157,120	1,456,230	2,700,890	1,515,625	303,125	882,140

1/ Recommended 20 percent acceleration.

TABLE 11

Estimated Land Treatment Costs for Cropland

Problem	Acres	Installation Cost	Technical Cost	Total Cost
		SUBBASIN I		
Minor Problems*	21,760	-	-	-
Erosion	260,050	$ 5,681,760	$ 1,343,495	$ 7,025,255
Excess Water	95,080	9,757,347	1,646,201	11,403,548
Unfavorable Soil Conditions	28,680	324,405	75,499	399,904
Subtotal	405,570	15,763,512	3,065,196	18,828,707
		SUBBASIN II		
Minor Problems*	12,640	-	-	-
Erosion	222,760	$ 5,885,749	$ 1,154,052	$ 7,039,801
Excess Water	74,985	8,132,550	1,390,818	9,523,368
Unfavorable Soil Conditions	1,520	17,375	3,999	21,374
Subtotal	311,905	14,035,674	2,548,869	16,584,543
		SUBBASIN III		
Minor Problems*	10,630	-	-	-
Erosion	218,930	$ 5,643,192	$ 1,155,852	$ 6,799,044
Excess Water	42,880	4,176,975	683,659	4,860,634
Unfavorable Soil Conditions	13,065	149,352	34,394	183,746
Subtotal	285,505	9,969,519	1,873,905	11,843,424
		SUBBASIN IV		
Minor Problems*	1,890	-	-	-
Erosion	82,680	$ 2,067,962	$ 429,050	$ 2,497,012
Excess Water	8,130	795,517	131,383	926,900
Unfavorable Soil Conditions	2,320	26,521	6,107	32,628
Subtotal	95,020	2,890,000	566,540	3,456,540
		SUBBASIN V		
Minor Problems*	10,770	-	-	-
Erosion	205,040	$ 4,851,389	$ 1,044,222	$ 5,895,611
Excess Water	28,480	2,702,417	447,373	3,149,793
Unfavorable Soil Conditions	6,340	72,485	16,691	89,176
Subtotal	250,630	7,626,291	1,508,286	9,134,577
		SUBBASIN VI		
Minor Problems*	2,476	-	-	-
Erosion	245,164	$ 5,615,003	$ 1,170,105	$ 6,785,108
Excess Water	22,970	2,533,218	450,168	2,983,386
Unfavorable Soil Conditions	17,960	205,308	47,280	252,588
Subtotal	288,570	8,353,529	1,667,553	10,021,082
		SUBBASIN VII		
Minor Problems*	9,650	-	-	-
Erosion	237,100	$ 5,575,261	$ 1,182,147	$ 6,757,408
Excess Water	21,360	2,147,574	365,678	2,513,252
Excess Water	21,360	2,147,574	365,678	2,513,252
Unfavorable Soil Conditions	11,080	126,656	29,168	155,824
Subtotal	279,190	7,849,791	1,576,993	9,426,484
		SUBBASIN VIII		
Minor Problems*	21,630	-	-	-
Erosion	714,070	$16,628,444	$ 3,593,095	$20,221,539
Excess Water	40,240	3,853,504	642,773	4,496,277
Unfavorable Soil Conditions	8,570	97,969	22,561	120,530
Subtotal	784,510	20,579,917	4,258,429	24,838,346
TOTAL	2,700,890	$87,068,933	$17,065,770	$104,134,703

* No permanent type practices required.

TABLE 12

Estimated Accelerated Land Treatment Costs for Cropland to 1985 1/

Dominant Problem	Acres of Accelerated Treatment to 1985 1/	Installation Cost	Technical Cost	Total Cost
		SUBBASIN I		
Erosion	30,999	$ 677,328	$ 160,265	$ 837,593
Excess Water	11,410	1,170,894	197,507	1,368,401
Unfavorable Soils	4,015	45,410	10,559	55,969
Subtotal	46,424	1,893,632	368,331	2,261,963
		SUBBASIN II		
Erosion	25,894	$ 684,119	$ 134,131	$ 818,250
Excess Water	8,998	975,923	166,913	1,142,836
Unfavorable Soils	213	2,435	560	2,995
Subtotal	35,105	1,662,477	301,604	1,964,081
		SUBBASIN III		
Erosion	25,251	$ 650,971	$ 133,325	$ 784,296
Excess Water	5,146	501,272	82,027	583,299
Unfavorable Soils	1,829	20,905	4,810	25,715
Subtotal	32,226	1,173,148	220,162	1,393,310
		SUBBASIN IV		
Erosion	9,303	$ 232,668	$ 48,283	$ 280,951
Excess Water	976	95,502	15,772	111,274
Unfavorable Soils	325	3,715	855	4,570
Subtotal	10,604	331,885	64,910	396,795
		SUBBASIN V		
Erosion	23,739	$ 561,665	$ 120,832	$ 682,497
Excess Water	3,418	324,334	53,697	378,031
Unfavorable Soils	888	10,150	2,335	12,485
Subtotal	28,045	896,149	176,864	1,073,013
		SUBBASIN VI		
Erosion	27,240	$ 623,796	$ 129,935	$ 753,731
Excess Water	2,756	303,932	54,018	357,950
Unfavorable Soils	2,514	28,735	6,612	35,347
Subtotal	32,510	956,463	190,565	1,147,028
		SUBBASIN VII		
Erosion	27,142	$ 638,108	$ 135,439	$ 773,547
Excess Water	2,563	257,684	43,879	301,563
Unfavorable Soils	1,551	17,728	4,079	21,807
Subtotal	31,256	913,520	183,397	1,096,917
		SUBBASIN VIII		
Erosion	80,926	$1,884,767	$ 407,058	$ 2,291,825
Excess Water	4,829	462,425	77,119	539,544
Unfavorable Soils	1,200	13,716	3,156	16,872
Subtotal	86,955	2,360,908	487,333	2,848,241
		BASIN TOTAL		
Erosion	250,494	$5,953,422	$1,269,268	$ 7,222,690
Excess Water	40,096	4,091,966	690,932	4,782,898
Unfavorable Soils	12,535	142,794	32,966	175,760
Total	303,125	$10,188,182	$1,993,166	$12,181,348

1/ Recommended 20 percent acceleration.

TABLE 13

Pasture Treatment Program Timetable

Treatment or Problem	Total Acreage Needing Treatment as of 1964	Estimated Acreage to be Treated 1964 - 1985 Present Programs	Estimated Acreage of Accelerated Land Treatment to 1985 1/	Acreage Needing Treatment after 1985
SUBBASIN I				
Acres Needing Treatment	355,750	249,025	49,805	56,920
Establishment, Reestablishment and Improvement of Cover	349,145	244,401	48,880	55,864
Erosion, Overgrazing and Encroachment of Plants	101,213	70,849	14,170	16,194
Excess Water	59,180	41,426	8,285	9,469
SUBBASIN II				
Acres Needing Treatment	158,720	111,104	28,221	25,395
Establishment, Reestablishment and Improvement of Cover	121,405	84,983	16,997	19,425
Erosion, Overgrazing and Encroachment of Plants	37,577	26,304	5,261	6,012
Excess Water	15,570	10,899	2,180	2,491
SUBBASIN III				
Acres Needing Treatment	117,110	81,977	16,395	18,738
Establishment, Reestablishment and Improvement of Cover	104,550	73,185	14,637	16,728
Erosion, Overgrazing and Encroachment of Plants	6,880	4,816	963	1,101
Excess Water	38,240	26,768	5,354	6,118
SUBBASIN IV				
Acres Needing Treatment	22,710	15,897	3,179	3,634
Establishment, Reestablishment and Improvement of Cover	21,010	14,707	2,941	3,362
Erosion, Overgrazing and Encroachment of Plants	2,240	1,568	314	358
Excess Water	3,940	2,758	552	630
SUBBASIN V				
Acres Needing Treatment	58,090	40,663	8,133	9,294
Establishment, Reestablishment and Improvement of Cover	51,190	35,833	7,167	8,190
Erosion, Overgrazing and Encroachment of Plants	7,710	5,397	1,079	1,234
Excess Water	8,180	5,726	1,145	1,304
SUBBASIN VI				
Acres Needing Treatment	89,800	62,860	12,572	14,368
Establishment, Reestablishment and Improvement of Cover	81,960	57,372	11,474	13,114
Erosion, Overgrazing and Encroachment of Plants	9,230	6,461	1,292	1,477
Excess Water	14,040	9,828	1,966	2,246
SUBBASIN VII				
Acres Needing Treatment	45,610	31,927	6,385	7,298
Establishment, Reestablishment and Improvement of Cover	42,680	29,876	5,975	6,829
Erosion, Overgrazing and Encroachment of Plants	2,890	2,023	405	462
Excess Water	10,560	7,392	1,478	1,690
SUBBASIN VIII				
Acres Needing Treatment	142,570	99,799	19,960	22,811
Establishment, Reestablishment and Improvement of Cover	130,550	91,385	18,277	20,888
Erosion, Overgrazing and Encroachment of Plants	19,770	13,839	2,768	3,163
Excess Water	40,270	28,189	5,638	6,443
BASIN TOTAL				
Acres Needing Treatment	990,360	693,252	138,650	158,458
Establishment, Reestablishment and Improvement of Cover	902,490	631,742	126,348	144,400
Erosion, Overgrazing and Encroachment of Plants	187,510	131,257	26,252	30,001
Excess Water	189,980	132,986	26,598	30,396

1/ Recommended 20 percent acceleration.

TABLE 14

Estimated Land Treatment Costs for Pastureland

Practice or Problem	Acres	Installation Cost	Technical Cost	Total Cost
SUBBASIN I				
Establishment, Reestablishment and Improvement of Cover	349,145	$ 17,658,009	$ 307,247	$ 17,965,256
Erosion, Overgrazing and Encroachment of Plants	101,213	1,766,521	325,906	2,092,427
Excess Water	59,180	5,225,890	776,856	6,002,746
Subtotal	-	24,650,420	1,410,009	26,060,429
SUBBASIN II				
Establishment, Reestablishment and Improvement of Cover	121,406	$ 6,188,670	$ 106,838	$ 6,295,508
Erosion, Overgrazing and Encroachment of Plants	37,576	655,825	100,995	756,820
Excess Water	15,577	1,375,527	204,479	1,580,006
Subtotal	-	8,220,022	412,312	8,632,334
SUBBASIN III				
Establishment, Reestablishment and Improvement of Cover	104,550	$ 5,287,618	$ 92,005	$ 5,379,623
Erosion, Overgrazing and Encroachment of Plants	6,880	120,080	22,153	142,233
Excess Water	38,240	3,379,828	502,987	3,882,815
Subtotal	-	8,787,526	617,145	9,404,671
SUBBASIN IV				
Establishment, Reestablishment and Improvement of Cover	21,010	$ 1,062,581	$ 18,488	$ 1,081,069
Erosion, Overgrazing and Encroachment of Plants	2,240	39,096	7,212	46,308
ExcessWater	3,940	347,922	51,720	399,642
Subtotal	-	1,449,599	77,420	1,527,019
SUBBASIN V				
Establishment, Reestablishment and Improvement of Cover	51,190	$ 2,588,934	$ 45,048	$ 2,633,982
Erosion, Overgrazing and Encroachment of Plants	7,710	134,567	24,826	159,393
Excess Water	8,180	722,335	107,379	829,714
Subtotal	-	3,445,836	177,253	3,623,089
SUBBASIN VI				
Establishment, Reestablishment and Improvement of Cover	81,960	$ 4,145,127	$ 72,125	$ 4,217,252
Erosion Overgrazing and Encroachment of Plants	9,230	161,119	29,724	190,843
Excess Water	14,040	1,239,802	184,303	1,424,105
Subtotal	-	5,546,048	286,152	5,832,200
SUBBASIN VII				
Establishment, Reestablishment and Improvement of Cover	42,680	$ 2,158,541	$ 37,558	$ 2,196,099
Erosion, Overgrazing and Encroachment of Plants	2,895	50,528	9,322	59,850
Excess Water	10,560	932,501	138,623	1,071,124
Subtotal	-	3,141,570	185,503	3,327,073
SUBBASIN VIII				
Establishment, Reestablishment and Improvement of Cover	130,550	$ 6,602,566	$ 114,885	$ 6,717,451
Erosion, Overgrazing and Encroachment of Plants	19,770	345,054	63,659	408,713
Excess Water	40,270	556,043	528,624	4,084,667
Subtotal	-	10,503,663	707,168	11,210,831
TOTAL	990,360	$ 65,744,684	$ 3,872,962	$ 69,617,646

1/ Total pasture acreage needing treatment. Column total exceeds this acreage because of overlapping treatment.

TABLE 15

Estimated Accelerated Land Treatment Costs for Pastureland to 1985 1/

Dominant Problem	Acres of Accelerated Treatment to 1985	Installation Cost	Technical Cost	Total Cost
SUBBASIN I				
Acres Needing Treatment	49,805	$3,451,265	$197,423	$3,648,688
Establishment, Reestablishment and Improvement of Cover	48,880	2,472,350	43,014	2,515,364
Erosion, Overgrazing and Encroachment of Plants	14,170	247,267	45,627	292,894
Excess Water	8,285	731,648	108,782	840,430
SUBBASIN II				
Acres Needing Treatment	22,221	$1,144,028	$ 60,564	$1,204,592
Establishment, Reestablishment and Improvement of Cover	16,997	859,708	14,957	874,665
Erosion, Overgrazing and Encroachment of Plants	5,261	91,804	16,940	108,744
Excess Water	2,180	192,516	28,667	221,183
SUBBASIN III				
Acres Needing Treatment	16,395	$1,229,955	$ 86,279	$1,316,234
Establishment, Reestablishment and Improvement of Cover	14,637	740,339	12,880	753,219
Erosion, Overgrazing and Encroachment of Plants	963	16,804	3,101	19,905
Excess Water	5,354	472,812	70,298	543,110
SUBBASIN IV				
Acres Needing Treatment	3,179	$ 202,982	$ 10,847	$ 213,829
Establishment, Reestablishment and Improvement of Cover	2,941	148,756	2,588	151,344
Erosion, Overgrazing and Encroachment of Plants	314	5,479	1,011	6,490
Excess Water	552	48,747	7,248	55,995
SUBBASIN V				
Acres Needing Treatment	8,133	$ 482,451	$ 24,815	$ 507,266
Establishment, Reestablishment and Improvement of Cover	7,167	362,507	6,307	368,814
Erosion, Overgrazing and Encroachment of Plants	1,079	18,829	3,474	22,303
Excess Water	1,145	101,115	15,034	116,149
SUBBASIN VI				
Acres Needing Treatment	12,572	$ 780,992	$ 39,386	$ 820,378
Establishment, Reestablishment and Improvement of Cover	11,474	584,830	10,097	594,927
Erosion, Overgrazing and Encroachment of Plants	1,292	22,545	3,475	26,020
Excess Water	1,966	173,617	25,814	199,431
SUBBASIN VII				
Acres Needing Treatment	6,385	$ 439,805	$ 25,968	$ 465,773
Establishment, Reestablishment and Improvement of Cover	5,975	302,216	5,258	307,474
Erosion, Overgrazing and Encroachment of Plants	405	7,067	1,304	8,371
Excess Water	1,478	130,522	19,406	49,928
SUBBASIN VIII				
Acres Needing Treatment	19,960	$1,470,645	$ 99,024	$1,569,669
Establishment, Reestablishment and Improvement of Cover	18,277	924,451	16,084	940,535
Erosion, Overgrazing and Encroachment of Plants	2,768	48,302	8,913	57,215
Excess Water	5,638	497,892	74,027	571,919
BASIN TOTAL				
Acres Needing Treatment	138,650	$9,202,123	$544,306	$9,746,429
Establishment, Reestablishment and Improvement of Cover	126,348	6,395,157	111,185	6,506,342
Erosion, Overgrazing and Encroachment of Plants	26,252	458,097	83,845	541,942
Excess Water	26,598	2,348,869	349,276	2,698,145

1/ Recommended 20 percent acceleration.

TABLE 16

Estimated Erosion Reduction Resulting from Treatment of Cropland 1/

	Average Soil Loss Tons Per Acre Per Year	Estimated Acres to be Treated 1964-1985 Present Programs	Average Erosion Tons Per Year	Estimated Acres of Accelerated Land Treatment to 1985 2/	Average Erosion Tons Per Year	Estimated Acres to be Treated after 1985	Average Erosion Tons Per Year	Estimated Total Acres to be Treated	Average Erosion Tons Per Year	Percent Reduction
				SUBBASIN I						
Untreated	2.9	154,996	449,488	30,999	89,897	95,815	277,864	281,810	817,249	
Treated	2.1	154,996	325,492	30,999	65,098	95,815	201,212	591,801		
Reduction	0.8	-	123,996	-	24,799	-	76,652	-	225,448	28
				SUBBASIN II						
Untreated	4.5	129,470	582,615	25,894	116,523	80,036	360,162	235,400	1,059,300	
Treated	1.9	129,470	245,993	25,894	49,199	80,036	152,068	235,400	447,260	
Reduction	2.6	-	336,622	-	67,324	-	208,094	-	612,040	58
				SUBBASIN III						
Untreated	4.9	126,258	618,664	25,251	123,730	78,051	382,450	229,560	1,124,844	
Treated	2.1	126,258	265,142	25,251	53,027	78,051	163,907	229,560	482,076	
Reduction	2.8	-	353,522	-	70,703	-	218,543	-	642,768	57
				SUBBASIN IV						
Untreated	5.5	46,514	255,827	9,303	51,167	28,753	158,142	84,570	465,135	
Treated	1.7	46,514	79,074	9,303	15,815	28,753	48,880	84,570	143,768	
Reduction	3.8	-	176,753	-	35,352	-	109,262	-	321,366	69
				SUBBASIN V						
Untreated	6.1	118,695	724,040	23,739	144,808	73,376	447,594	215,810	1,316,442	
Treated	3.0	118,695	356,085	23,739	71,217	73,376	220,128	215,810	647,430	
Reduction	3.1	-	367,955	-	73,591	-	227,466	-	669,012	51
				SUBBASIN VI						
Untreated	4.2	136,202	572,048	27,240	114,408	84,198	353,632	247,640	1,040,088	
Treated	1.2	136,202	163,442	27,240	32,688	84,198	101,038	247,640	297,168	
Reduction	3.0	-	408,606	-	81,720	-	252,594	-	742,920	71
				SUBBASIN VII						
Untreated	8.2	135,712	1,112,838	27,142	222,564	83,896	687,947	246,750	2,023,350	
Treated	1.8	135,712	244,282	27,142	48,856	83,896	151,013	246,750	444,150	
Reduction	6.4	-	863,556	-	173,708	-	536,934	-	1,579,200	78
				SUBBASIN VIII						
Untreated	11.0	404,629	4,450,919	80,926	890,186	250,135	2,751,485	735,690	8,082,590	
Treated	2.6	404,629	1,052,035	80,926	210,408	250,135	650,351	735,690	1,912,794	
Reduction	8.4	-	3,398,884	-	679,778	-	2,101,134	-	6,179,796	76
TOTAL REDUCTION		1,252,476	6,034,894	250,494	1,206,975	774,260	3,730,679	2,277,230	10,972,550	68

1/ Erosion reduction calculated on cropland acreage having only a dominant erosion problem using Musgrave's Probable Soil Loss Formula.
2/ Recommended 20 percent acceleration.

TABLE 17

Estimated Surface Runoff Reduction Resulting from Treatment of Cropland 1/

	Runoff from 100-Yr. Freq. 4-Day Duration (Inches)	Acres to be Treated 1964 - 1965 Present Programs	Total Storm Runoff (Ac. Ft.)	Estimated Acres of Accelerated Land Treatment to 1985 2/	Total Storm Runoff (Ac. Ft.)	Acres to be Treated after 1985	Total Storm Runoff (Ac. Ft.)	Total Acres to be Treated	Total Storm Runoff (Ac. Ft.)	Percent Reduction
				SUBBASIN I						
Untreated	5.20	158,800	68,808	31,760	13,762	98,170	42,537	288,730	125,107	
Treated	4.77	158,800	63,123	31,760	12,625	98,170	39,022	288,730	114,770	
Reduction	0.43	-	5,685	-	1,137	-	3,515	-	10,337	8.3
				SUBBASIN II						
Untreated	4.69	123,350	48,205	24,670	9,641	76,260	29,802	224,280	87,648	
Treated	4.25	123,350	43,691	24,670	8,738	76,260	27,011	224,280	79,440	
Reduction	0.44	-	4,514	-	903	-	2,791	-	8,208	9.4
				SUBBASIN III						
Untreated	5.40	127,600	57,420	25,520	11,484	78,875	35,494	231,995	104,398	
Treated	4.92	127,600	52,316	25,520	10,463	78,875	32,339	231,995	95,118	
Reduction	0.48	-	5,104	-	1,021	-	3,155	-	9,280	8.9
				SUBBASIN IV						
Untreated	4.82	46,750	18,779	9,350	3,756	28,900	11,609	85,000	34,144	
Treated	4.38	46,750	17,064	9,350	3,413	28,900	10,548	85,000	31,025	
Reduction	0.44	-	1,715	-	343	-	1,061	-	3,119	9.1
				SUBBASIN V						
Untreated	5.03	116,260	48,736	23,252	9,747	71,868	30,927	211,380	88,610	
Treated	4.57	116,260	44,272	23,252	8,854	71,868	27,368	211,380	80,494	
Reduction	0.46	-	4,464	-	893	-	2,759	-	8,116	9.2
				SUBBASIN VI						
Untreated	5.26	144,718	63,430	28,944	12,686	89,462	39,211	263,124	115,327	
Treated	4.79	144,718	57,771	28,944	11,554	89,462	35,714	263,124	105,039	
Reduction	0.47	-	5,659	-	1,132	-	3,497	-	10,288	8.9
				SUBBASIN VII						
Untreated	5.66	136,500	64,387	27,300	12,877	84,380	39,803	248,180	117,067	
Treated	5.20	136,500	59,145	27,300	11,829	84,380	36,562	248,180	107,536	
Reduction	0.46	-	5,242	-	1,048	-	3,241	-	9,531	8.1
				SUBBASIN VIII						
Untreated	5.98	397,450	198,049	79,490	39,610	245,700	122,432	722,640	360,091	
Treated	5.50	397,450	182,151	79,490	36,430	245,700	112,605	722,640	331,186	
Reduction	0.48	-	15,898	-	3,180	-	9,827	-	28,905	8.0
TOTAL REDUCTION		1,251,428	48,281	250,286	9,657	773,615	29,846	2,275,329	87,784	8.7

1/ Runoff reduction calculated on cropland having dominant erosion and unfavorable soil conditions using Chapter 9 of NEH, Sect. 4, Hydrology procedure.
2/ Recommended 20 percent acceleration.

TABLE 18

Estimated Erosion Reduction Resulting from Treatment of Pastureland 1/

	Average Soil Loss Tons Per Acre Per Year	Estimated Acres to be Treated 1964-1985 Present Programs	Average Erosion Tons Per Year	Estimated Acres of Accelerated Land Treatment to 1985 2/	Average Erosion Tons Per Year	Estimated Acres to be Treated after 1985	Average Erosion Tons Per Year	Estimated Total Acres to be Treated	Average Erosion Tons Per Year	Percent Reduction
					SUBBASIN I					
Untreated	0.4	244,401	97,760	48,880	19,552	55,864	22,346	349,145	139,658	
Treated	0.3	244,401	73,320	48,880	14,664	55,864	16,760	349,145	104,744	
Reduction	0.1	-	24,440	-	4,888	-	5,586	-	34,914	25
					SUBBASIN II					
Untreated	1.3	84,983	110,478	16,997	22,096	19,425	25,253	121,405	157,827	
Treated	0.4	84,983	33,993	16,997	6,799	19,425	7,770	121,405	48,562	
Reduction	0.9	-	76,485	-	15,297	-	17,483	-	109,265	69
					SUBBASIN III					
Untreated	1.9	73,185	139,051	14,637	27,810	16,728	31,783	104,550	198,645	
Treated	0.4	73,185	29,274	14,637	5,855	16,728	6,691	104,550	41,820	
Reduction	1.5	-	109,277	-	21,955	-	25,092	-	156,825	79
					SUBBASIN IV					
Untreated	2.3	14,707	33,826	2,941	6,764	3,362	7,733	21,010	48,323	
Treated	0.3	14,707	4,412	2,941	882	3,362	1,009	21,010	6,303	
Reduction	2.0	-	29,414	-	5,882	-	6,724	-	42,020	87
					SUBBASIN V					
Untreated	2.7	35,833	96,749	7,167	19,351	8,190	22,113	51,190	138,213	
Treated	0.3	35,833	10,750	7,167	2,150	8,190	2,457	51,190	15,357	
Reduction	2.4	-	85,999	-	17,201	-	19,656	-	122,856	89
					SUBBASIN VI					
Untreated	2.3	57,372	131,956	11,474	26,390	13,114	30,162	81,960	188,508	
Treated	0.5	57,372	28,686	11,474	5,737	13,114	6,557	81,960	40,980	
Reduction	1.8	-	103,270	-	20,653	-	23,605	-	147,528	78
					SUBBASIN VII					
Untreated	2.5	29,876	74,690	5,975	14,938	6,829	17,072	42,680	106,700	
Treated	0.6	29,876	17,926	5,975	3,585	6,829	4,097	42,680	25,608	
Reduction	1.9	-	56,764	-	11,353	-	12,975	-	81,092	76
					SUBBASIN VIII					
Untreated	1.6	91,385	146,216	18,277	29,243	20,888	33,421	130,550	208,880	
Treated	0.5	91,385	45,693	18,277	9,139	20,888	10,444	130,550	65,275	
Reduction	1.1	-	100,523	-	20,104	-	22,977	-	143,605	69
TOTAL REDUCTION			586,672	126,348	117,333	-	134,098	-	838,105	71

1/ Erosion reduction calculated, using Musgrave's Probable Soil Loss Formula, on pastureland acreage to be established, reestablished, or where vegetation needs to be improved.

2/ Recommended 20 percent acceleration.

TABLE 19

Estimated Surface Runoff Reduction Resulting from Treatment of Pastureland [1]

	Runoff from 100-Yr. Storm 4-Day Duration (Inches)	Acres to be Treated 1964 - 1965 Present Programs	Total Storm Runoff (Ac.Ft.)	Estimated Acres of Accelerated Land Treatment to 1985 [2]	Total Storm Runoff (Ac. Ft.)	Acres to be Treated after 1985	Total Storm Runoff (Ac. Ft.)	Total Acres to be Treated	Total Storm Runoff (Ac. Ft.)	Percent Reduction
				SUBBASIN I						
Untreated	4.14	244,401	84,318	48,880	16,864	55,864	19,273	349,145	120,455	
Treated	3.93	244,401	80,041	48,880	16,008	55,864	18,296	349,145	114,345	
Reduction	0.21	-	4,277	-	856	-	977	-	6,110	5.1
				SUBBASIN II						
Untreated	3.61	84,983	25,563	16,997	5,113	19,425	5,843	121,405	36,519	
Treated	3.41	84,983	24,152	16,997	4,830	19,425	5,521	121,405	34,503	
Reduction	0.20	-	1,411	-	283	-	322	-	2,016	5.5
				SUBBASIN III						
Untreated	4.18	14,637	25,490	14,637	5,098	16,728	5,826	104,550	36,414	
Treated	3.96	73,185	24,151	14,637	4,830	16,728	5,520	104,550	34,501	
Reduction	0.22	-	1,339	-	268	-	306	-	1,913	5.3
				SUBBASIN IV						
Untreated	3.60	14,707	4,412	2,941	882	3,362	1,009	21,010	6,303	
Treated	3.38	14,707	4,143	2,941	829	3,362	947	21,010	5,919	
Reduction	0.22	-	269	-	53	-	62	-	384	6.1
				SUBBASIN V						
Untreated	3.62	35,833	10,811	7,167	2,162	8,190	2,471	51,190	15,444	
Treated	3.40	35,833	10,151	7,167	2,030	8,190	2,321	51,190	14,502	
Reduction	0.22	-	660	-	132	-	150	-	942	6.1
				SUBBASIN VI						
Untreated	4.07	57,372	19,461	11,474	3,892	13,114	4,448	81,960	27,801	
Treated	3.84	57,372	18,359	11,474	3,672	13,114	4,196	81,960	26,227	
Reduction	0.23	-	1,102	-	220	-	252	-	1,574	5.7
				SUBBASIN VII						
Untreated	4.40	29,876	10,956	5,975	2,191	6,829	2,504	42,680	15,651	
Treated	4.17	29,876	10,382	5,975	2,076	6,829	2,373	92,680	14,831	
Reduction	0.23	-	574	-	115	-	131	-	820	5.2
				SUBBASIN VIII						
Untreated	4.54	91,385	34,571	18,277	6,914	20,888	7,902	130,550	49,387	
Treated	4.31	91,385	32,825	18,277	6,565	20,888	7,503	130,550	46,893	
Reduction	0.23	-	1,746	-	349	-	399	-	2,494	5.1
TOTAL REDUCTION		631,743	11,378	126,348	2,276	144,400	2,599	902,490	16,253	5.5

1/ Runoff reduction calculated on pastureland requiring establishment, reestablishment, and improvement of cover conditions only using an adopted revision of Chapter 9 of NEH, Sect. 4, Hydrology procedure.

2/ Recommended 20 percent acceleration.

TABLE 20

Forest Land Area and Ownership by Subbasin - 1967

Subbasin	Total Forest Land (Acres)	Private (Acres)	Public (Acres)	Percent Public
I	1,381,300	1,195,993	185,307	13
II	714,550	677,384	37,166	5
III	1,290,110	1,134,492	155,620	12
IV	1,583,940	1,029,903	554,037	35
V	1,900,290	1,122,525	778,763	41
VI	1,443,340	1,180,340	263,000	18
VII	714,950	538,260	176,690	25
VIII	643,520	558,420	85,100	13
TOTALS	9,673,000	7,437,317	2,235,683	23

TABLE 21

Stand Size Distribution by Subbasin - 1966

Subbasin	Stand Size Class by Percent		
	Seedlings and Saplings	Poles	Sawtimber
I	12	58	30
II	19	56	25
III	15	52	33
IV	6	59	35
V	5	61	34
VI	12	61	27
VII	11	44	45
VIII	7	48	45
Average	10	57	33

TABLE 2.

Acreage of Forest Land Treatment Needs by Subbasin - 1967

Practice	Subbasin I	Subbasin II	Subbasin III	Subbasin IV	Subbasin V	Subbasin VI	Subbasin VII	Subbasin VIII	Total Basin Needs
Protection from Fire	1,381,300	714,550	1,298,112	1,583,940	1,901,288	1,443,340	714,950	643,520	9,673,000
Protection from Grazing	168,813	88,184	147,603	-	40,800	338,200	61,100	26,300	891,000
Protection from Overcutting	1,177,703	443,629	743,668	566,955	1,458,045	1,125,700	434,088	306,412	6,256,200
Hydrologic Stand Improvement	464,801	421,976	811,523	869,312	980,288	684,000	302,551	437,649	4,972,100
Reforestation									
Watershed Protection	36,900	21,600	31,500	21,150	23,850	9,000	3,480	2,520	150,000
Critical Areas	8,200	4,800	7,000	7,050	7,950	4,000	2,320	1,680	43,000
Erosion Control									
Skid Trails & Access Roads	1,435	840	1,225	1,316	1,484	2,600	638	462	10,000
Revegetation of Mining Areas (Tree & Shrub Plantings)									
Coal Strip Mines									93,000
Other Surface Mines									18,800

TABLE 23

Forest Land Treatment Needs by States (Acres)

Practice	Pennsylvania	New York	Maryland	Total
Protection from Fire	7,909,710	1,700,820	62,470	9,673,000
Protection from Grazing	628,600	252,700	5,700	891,000
Protection from Overcutting	5,115,700	1,099,800	40,700	6,256,200
Hydrologic Stand Improvement	4,065,700	875,100	31,300	4,972,100
Reforestation				
Watershed Protection	110,000	30,000	2,000	150,000
Critical Areas	35,000	7,000	1,000	43,000
Erosion Control				
Skid Trails, Log Roads, and Access Roads	8,000	1,700	300	10,000
Revegetation of Mining Areas (Tree and Shrub Plantings)				
Coal Strip Mines				93,000
Surface-Mine Areas for Other Minerals				18,800

TABLE 24

Recommended Forestry Program 1970-1985
(Entire Basin)

Forest Land Treatment Measure	Unit	To Be Installed by Current Programs	Percent of Needs to Be Met by Current Programs	Recommended Accelerated Programs	Percent of Needs to Be Met by Accelerated Programs	Established Cost of Recommended Accelerated Programs *	
						Tech. Assistance	Installations
Protection from Fire	Acre	9,673,000	100	-	-	-	-
Protection from							
Overgrazing by	Acre	27,000	3	418,500	47	167,000	1,569,000
Fencing	Mile	170		2,600			
Protection from Overcutting	Acre	514,000	8	1,050,000	17	10,762,000	2,100,000
Reforestation							
Watershed Protection	Acre	90,000	60	22,500	15	292,000	720,000
Critical Areas	Acre	22,500	52	9,700	23	126,000	340,000
Hydrologic Stand Improvement	Acre	507,000	10	736,000	15	8,832,000	18,400,000
Erosion Control	Acre	6,100	61	1,400	14	4,000	56,000
Skid Trails and Log Roads	Mile	2,540		510		-	-
Mine Area Revegetation (Tree and Shrub Plantings)							
Coal Strip Mines		-	-	46,500	50	604,000	1,628,000
Surface-Mine Areas for Other Minerals		-	-	9,400	50	122,000	329,000
TOTAL						20,909,000	25,142,000

* Basis - 1966 Costs

TABLE 25

Estimate of Need for Treatment on Other Land - 1967

Dominant Problem	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat	Total Acreage	Treated or Treatment Not Feasible	Treatment Needed and Feasible to Treat
	SUBBASIN I			SUBBASIN II			SUBBASIN III		
Land with No Problems	7,314	7,314	-	8,176	8,176	-	6,068	6,068	-
Erosion	150,650	123,800	26,850	105,540	80,424	23,116	108,590	94,[illegible]	13,[illegible]
Excess Water	85,740	71,825	13,915	35,210	3[illegible],435	2,775	21,872	19,202	2,670
Unfavorable Soil Conditions	60,686	55,740	4,946	10,754	9,910	844	39,350	36,750	2,600
TOTAL	304,390	258,679	45,711	157,680	130,945	26,735	175,880	156,205	18,975
	SUBBASIN IV			SUBBASIN V			SUBBASIN VI		
Land with No Problems	1,260	1,260	-	6,670	6,670	-	5,990	5,990	-
Erosion	59,570	43,220	16,350	91,690	69,970	21,720	61,830	46,430	15,400
Excess Water	12,250	11,208	1,042	12,600	11,568	1,032	9,780	8,950	830
Unfavorable Soil Conditions	3,170	2,728	442	12,070	10,449	1,621	4,460	3,800	660
TOTAL	76,250	58,416	17,834	123,030	98,657	24,373	82,060	65,170	16,890
	SUBBASIN VII			SUBBASIN VIII			TOTAL BASIN		
Land with No Problems	2,290	2,290	-	3,710	3,710	-	41,478	41,478	-
Erosion	79,390	63,140	16,250	127,910	107,251	20,659	783,170	629,120	154,050
Excess Water	13,300	12,630	670	19,410	18,204	1,206	210,162	186,022	24,140
Unfavorable Soil Conditions	7,790	7,050	740	8,860	7,193	1,667	147,140	133,620	13,528
TOTAL	102,770	85,110	17,660	159,890	136,358	23,532	1,181,950	990,240	191,710